

AD-A166 007 DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM
(SBIR) ABSTRACTS OF PHASE 1 AWARDS 1983(U) DEPARTMENT
OF DEFENSE WASHINGTON DC 06 APR 84

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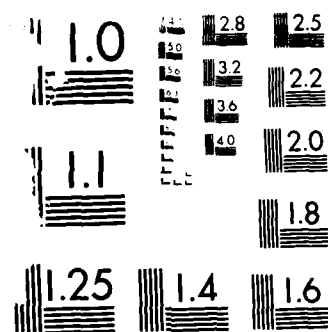
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Figure 1

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MICROCOPY RESOLUTION TEST CHART
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The Department of Defense

DoD Departments/Agency:



Department
of the
Army



Department
of the
Navy



Department
of the
Air Force



Defense
Advanced Research
Projects Agency



Defense
Nuclear
Agency

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**DEFENSE
SMALL BUSINESS
INNOVATION
RESEARCH PROGRAM (SBIR)**

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AD-A166 007

ABSTRACTS OF PHASE I AWARDS 1983

AD-A166 007

April 6, 1984

PREFACE

On November 14, 1983 Secretary of Defense Casper W. Weinberger announced the selection of 283 small business firms whose proposals under Phase I of the Fiscal Year 1983 Department of Defense Small Business Innovation Research (DoD-SBIR) Program will be funded upon successful completion of negotiations.

The selection of 283 proposals from small business research and development contractors was made from more than 2,900 proposals received by the Military Departments, the Defense Advanced Research Projects Agency (DARPA) and the Defense Nuclear Agency (DNA) in response to the Fiscal Year (FY) 1983 solicitation distributed on March 15, 1983 with a closing date of May 31, 1983.

In order to make information available on the technical content of the Phase I projects supported by the Department of Defense SBIR Program, this report presents the abstracts of those proposals which have resulted in award of contracts. In addition, the name and address of the firm performing the work are given for those who may desire additional information about the project.

Venture capital and large industrial firms that may have an interest in the research described in the abstracts in this publication are encouraged to contact the SBIR firm whose name, address, and phone number are shown.

INTRODUCTION

On July 22, 1982 the President signed (Public Law 97-219), the "Small Business Innovation Development Act of 1982." This law, effective October 1, 1982 is designed to give small high technology firms a greater share of Federal research and development contract awards.

The Act mandates that all Federal Agencies establish an SBIR program if their FY 1982 extramural budgets for research and development exceeded a threshold figure of \$100 million. (There are eleven government agencies meeting this requirement.) Beginning in FY 1983, the Department of Defense (DoD) must make available the following percentages of our extramural R&D budget for this program:

	FY 83	FY 84	FY 85	FY 86	FY 87	FY 88
Percentage	0.1	0.3	0.5	1.0	1.25	1.25
Estimated Dollars	16.7M	44M	79M	160M	240M	262M

The legislation for this act was modeled from a voluntary program that DoD instituted in FY 1982, the Defense Small Business Advanced Technology (DESAT) Program. In Phase I of DESAT, 100 contract awards of approximately \$50,000 each were made from 1103 proposals received. From the 100 Phase I awards, 33 Phase II awards were made in FY 1983. For FY 1983, the DoD Small Business Research and Development awards made included 283 Phase I SBIR proposals and 33 Phase II DESAT proposals for a total of \$20.6 million.

Objectives:

Objectives of the DoD-SBIR Program include stimulating technological innovation in the private sector, strengthening the role of small business in meeting DoD research and development needs, fostering and encouraging participation by minority and disadvantaged persons in technological innovation, and increasing the commercial application of DoD-supported research or research and development results.

The SBIR Program consists of three distinct phases. Under Phase I, DoD Components make awards to small businesses typically of one-half to one man-year effort over a period generally not to exceed six months, subject to negotiation. Phase I is to determine, insofar as possible, the scientific or technical merit and feasibility of ideas or concepts submitted under the SBIR program. Awards concentrate on that research or research and development that significantly contribute to proving the scientific or technical feasibility of the proposed effort, the successful completion of which is a prerequisite for further DoD support in Phase II.

Phase II awards will be made only to firms on the basis of results from the Phase I effort, and the scientific and technical merit of the Phase II proposal. In addition, special consideration will be given to proposals which identify a follow-on Phase III funding commitment from non-Federal sources. Phase II awards will typically cover 2 to 5 man-years of effort over a period generally not to exceed 24 months, subject to negotiation. The number of Phase II awards

will depend upon the success rate of Phase I studies and availability of funds. Phase II is the principal research or research and development effort, and will require a more comprehensive proposal which outlines the proposed effort in detail.

Phase III is expected to involve private-sector investment and support for any necessary development that will bring an innovation to the marketplace. Also under Phase III, DoD may award non-SBIR-funded follow-on contracts for products or processes meeting the mission needs of the Defense Department.

Selection Criteria

Phase I proposals received in each topic area in the DoD solicitation brochure were evaluated on a competitive basis in the organization where the topics were generated by scientists and engineers knowledgeable in that area according to the following criteria:

1. The scientific/technical quality of the research proposal and its relevance to the topic description, with special emphasis on its innovation and originality.
2. Qualifications of the principal investigator, other key staff, and consultants, if any, and the adequacy of available or obtainable instrumentation and facilities.
3. Anticipated benefits of the research to the total DoD research and development effort.

4. Adequacy of the Phase I proposed effort to show progress toward demonstrating the feasibility of the concept.

Reviewers based their conclusions only on information contained in the proposal. Final funding decisions were made on the basis of the above stated criteria along with considerations of such factors as duplication by other ongoing work and the overall program balance.

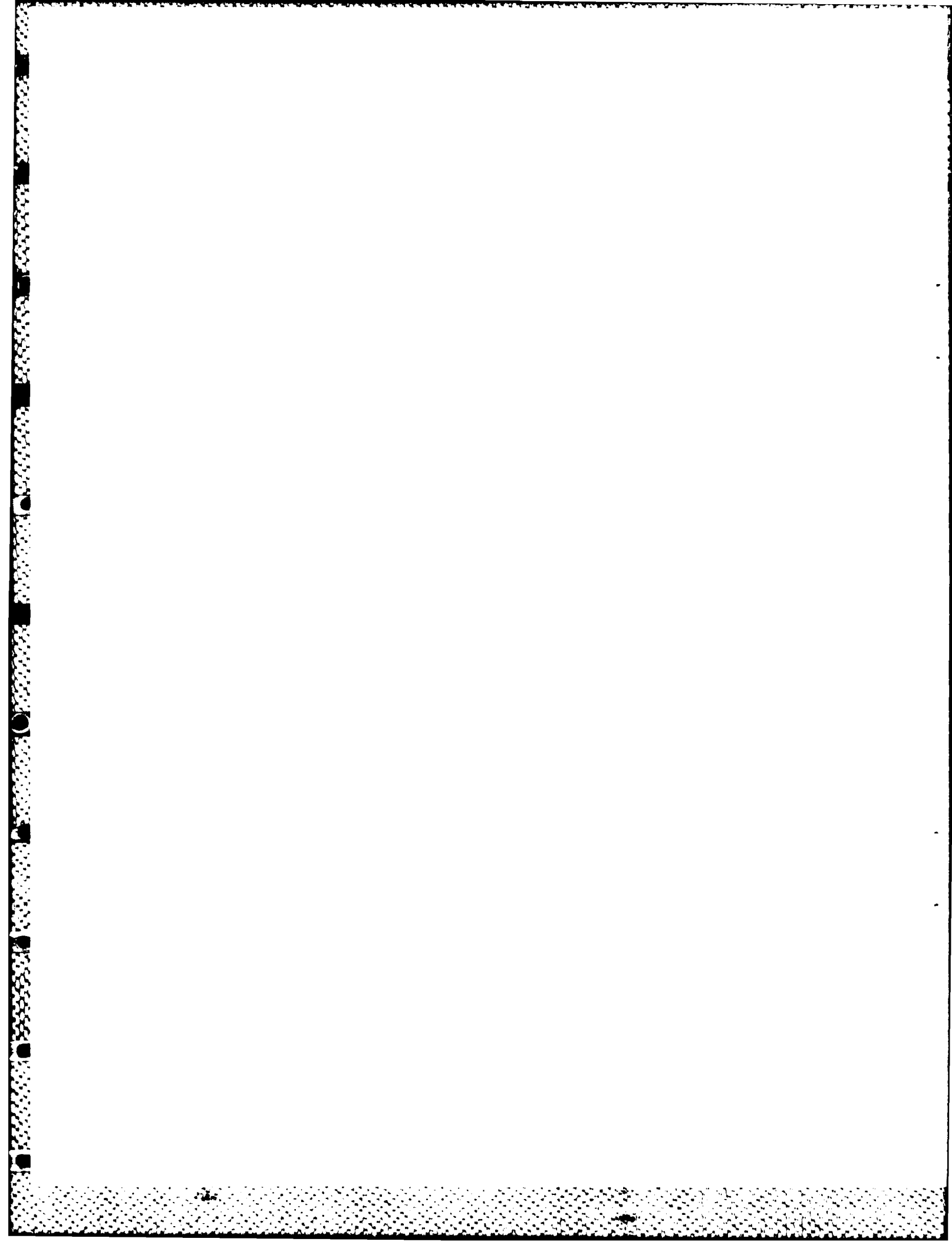
FY 1983 Phase I Awards by Service/Agency

	<u>Proposal Received Awards</u>	<u>Phase I</u>
Army	1246	96
Navy	944	67
AF	496	100
DARPA	128	12
DNA	<u>88</u>	<u>8</u>
	2902	283

Summary

Presentation of the technical abstracts which describe the nature of the funded FY 1983 Phase I SBIR projects is the main purpose of this report. Proprietary information is not provided in these abstracts; therefore, technical details may be missing. For this reason, this report supplies the names of individuals in these small business firms who may be contacted should more information be needed on a specific project.

QUALITY
COLLECTED
3



FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
A.K. ENGINEERING 73 FRESH POND PARKWAY CAMBRIDGE, MA 02138 D. ALEXANDER KOSO TITLE: TERRAIN HAZARD DETECTION SENSOR TOPIC: 5c OFFICE: MERDC	ARMY	\$ 53,578

THE TERRAIN HAZARD DETECTION SENSOR MEASURES THE CONTOUR OF THE TERRAIN IN FRONT OF A MOVING VEHICLE PROVIDING INFORMATION ABOUT TERRAIN SLOPE. IT MEASURES THE SIZE OF OBJECTS IN THE VEHICLE PATH AND ISSUES COMMANDS TO THE VEHICLE WHEN THE OBJECT IS TOO LARGE FOR THE VEHICLE TO PASS OVER AND ALSO MEASURES SIZES OF HOLES AND DITCHES IN THE VEHICLE PATH TO INSURE THAT THE VEHICLE CAN SAFELY PASS OVER THEM.

ABARIS 1254 ST. ALBERTS RENO, NV 89503 W L MURPHY TITLE: COMPOSITE MATERIAL DESIGNS FOR ASROC LAUNCHER MK112 TOPIC: 71 OFFICE: NSSC	NAVY	\$ 49,722
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ADVANCED COMPOSITES HAVE POTENTIAL FOR EFFECTING WEIGHT SAVINGS AND PROVIDING CORROSION RESISTANCE TO A VARIETY OF MILITARY APPLICATIONS. THE MK 112 ASROC LAUNCHER MODS 1-8 AND GUIDE, E 114, HAVE BEEN IDENTIFIED AS HAVING EXPERIENCED CORROSION AND WEIGHT PROBLEMS. THERE ARE A VARIETY OF RESINS AND FIBERS AVAILABLE FOR USE AS STRUCTURAL MATERIALS. THESE INCLUDE GLASS, KEVLAR & CARBON FIBERS, AND POLYESTER VINYLESTER AND EPOXY THERMOSET SYSTEMS. THERE ARE SOME NEW THERMOPLASTIC RESINS SUCH AS PEEK, WHICH WHEN REENFORCED WITH GLASS OR CARBON FIBERS, OFFER WEIGHT, STRENGTH, REPAIRABILITY AND PRODUCTIBILITY ADVANTAGES. ALL OF THESE MATERIALS WOULD BE SIGNIFICANTLY CORROSION FREE. THERE ARE A VARIETY OF MANUFACTURING METHODS, WET LAYUP, FILAMENT WINDING, ROOM TEMPERATURE OR OVEN CURVE, HIGH PRESSURE AUTO CLAVE,

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PRESS MOULDING, ETC. THIS ENGINEERING DEVELOPMENT WILL ANALYZE THE COMPONENTS OF THE ASROC LAUNCHER AND DETERMINE THE APPROPRIATE ADVANCED COMPOSITE MATERIAL & MANUFACTURING METHODS FOR SUBSTITUTION TO ACHIEVE WEIGHT REDUCTION & FREEDOM FROM CORROSION.

ABEL COMPANY
PEMBROKE, VA 24136
KENNETH ABEL

DARPA \$ 37,626

TITLE:

FEASIBILITY STUDY LEADING TO THE DEVELOPMENT OF A LIGHT WEIGHT, COMPACT SOLAR WATER DISTILLATION PURIFICATION DEVICE.

TOPIC: 8 OFFICE: DARPA

THIS STUDY WILL EXAMINE THE FEASIBILITY AND PRACTICALITY OF UTILIZING CHARCOAL CLOTH IN A LIGHT-WEIGHT SOLAR POWERED DISTILLATION PURIFICATION DEVICE INCORPORATING CHARCOAL CLOTH AS THE ENERGY ABSORBENT WATER WICK. IN THIS PROPOSED DEVICE, IT IS EXPECTED THAT THE CHARCOAL CLOTH WILL ACT NOT ONLY AS THE DISTILLATION MEDIA, BUT WILL ALSO REMOVE OBJECTIONABLE ORDORS, CO-DISTILLABLE ORGANIC COMPOUNDS AND BACTERIA/BACTERIAL SPORES FROM THE NON-POTABLE FEED WATERS.

ABIOMED
33 CHERRY HILL DRIVE
DANVERS, MA 01923
PARAM I. SINGH

ARMY \$ 45,130

TITLE:

A RUGGED NON-ELECTRONIC, GRAVITY INDEPENDENT INTRAVENOUS INFUSION SYSTEM

TOPIC: 6y OFFICE: SGRD

CURRENT INTRAVENOUS INFUSION SYSTEMS CAN BE DIVIDED INTO TWO BROAD GROUPS: SIMPLE GRAVITY-DEPENDENT INFUSION SETS AND SOPHISTICATED ELECTRONICALLY-CONTROLLED INFUSION PUMPS. THE FORMER ARE TOO INACCURATE AND OBSTRUSIVE AND THE LATTER TOO FRAGILE AND COSTLY FOR THE BATTLEFIELD ENVIRONMENT WHERE COMPACTNESS RUGGEDNESS, EASE OF USE AND STAND ALONE OPERATION ARE DESIRED. THIS PHASE I PROGRAM WILL ASSESS THE FEASIBILITY OF A CONCEPT TO ACHIEVE THESE FEATURES. THE SYSTEM WILL CONSIST OF A FLUID PRESSURE SOURCE (GAS OR GAS-LIQUID)

FISCAL YEAR 1983

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WHICH PROVIDES A CONSTANT DRIVING FORCE TO FLEXIBLE INFUSION BAGS. THE PRESSURE ON THE BAG IS MAINTAINED AT A SUFFICIENTLY HIGH LEVEL BY A PRESSURE REGULATOR SO THAT VARIATIONS IN A VENOUS PRESSURE AND VERTICAL POSITIONING OF THE BAG CAN CAUSE, AT MOST, A 5 PERCENT VARIATION IN DRIVING FORCE (AND ASSOCIATED FLOW RATE). FLOW CONTROL IS ACHIEVED BY A PRECISION RESTRICTOR ON THE DRIP LINE. SYSTEM COMPONENTS WILL BE SELECTED FROM COMMERCIALY AVAILABLE ITEMS AND/OR DESIGNED AND FABRICATED. THE SYSTEM WILL BE TESTED IN VITRO TO ASSESS THE ACCURACY OF FLOW CONTROL AND TO DEMONSTRATE INDEPENDENCE FROM GRAVITY. IN VIVO TESTS (DOGS AND CATS) WILL ASSESS EASE OF OPERATION AND SYSTEM DURABILITY. A MAJOR OBJECTIVE IS TO DEVELOP A RELIABLE, INEXPENSIVE SYSTEM WITH ESSENTIALLY UNLIMITED SHELF LIFE.

ADLER CORPORATION	NAVY	\$ 50,000
4801 MASSACHUSETTS AVE NW SUITE 360		
WASHINGTON, DC 20016		
R. E. ADLER		
TITLE:		
EMISSION STRATEGIES AND OPERATIONS IN MODERN NAVAL COMBAT SYSTEMS		
TOPIC: 40	OFFICE: NSSC	

EMISSION CONTROL (EMCON), INCLUDING RADAR EMISSION MANAGEMENT, IS A SUBDIVISION OF THE MUCH GREATER SUBJECT OF BATTLE MANAGEMENT. AT PRESENT, THERE IS NOT A FULL DEVELOPED AND NAVY ACCEPTED TECHNIQUE FOR EXAMINING THE ENTIRE TECHNICAL AND TACTICAL MANAGEMENT OF POTENTIAL SEA BATTLES. THIS PROPOSED EFFORT WILL FOCUS ON A VALUABLE SUBSET OF BATTLE STRATEGY, THE INTERPLAY BETWEEN ELECTROMAGNETIC EMISSION CONTROL AND FLEET OPERATION. THE TECHNICAL APPROACH IS BASED ON AN ANALYSIS OF EMCON STRATEGIES WITHIN GENERALLY ACCEPTED SCENARIOS BY DEFINING AND APPLYING VARIOUS OPERATIONAL CONCEPTS FOR BOTH SIDES IN THE CONFLICT. PROBABILISTIC UNCERTAINTIES AND RISKS WILL BE DETERMINED, USING STOCHASTIC COMPUTATION. CONTROL STRATEGIES WILL BE SELECTED ON THE BASIS OF GAME-THEORETIC PAYOFF MATRICES, CONSTRUCTED FROM GAIN AND LOSS MATRICES REFLECTING VARIOUS OUTCOMES OF THE OPERATIONAL CONCEPT.

FISCAL YEAR 1983

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ADVANCED APPLIED TECHNOLOGY, INC. 5170 126TH AVENUE, NORTH CLEARWATER, FL 33520 THOMAS R. LIVERMORE TITLE: MILLIMETER WAVE SEEKER RADAR CROSS SECTION DISPLAY SYSTEM TOPIC: 3i OFFICE: DRSMI-RN	ARMY	\$ 17,846

CURRENT TESTING OF MILLIMETER WAVE SEEKERS AND DATA ACQUISITION INVOLVE EXTENSIVE FLIGHT TESTING WITH VIDEO AND MAGNETIC TAPE USED TO RECORD DATA. A VIDEO DISPLAY WITH BORESIGHTED CROSSHAIR IS USED FOR OPERATOR DISPLAY. THIS PROPOSAL IS TO PROVIDE A REAL TIME READOUT OF CALIBRATED BACKGROUND OR TARGET CROSS SECTION ON THE VIDEO DISPLAY TO ENABLE BETTER USE OF FLIGHT TIME. THE READOUT WOULD ALSO BE DISPLAYED ON A DIGITAL DISPLAY ALONG WITH ALTITUDE AND CALCULATED DEPRESSION ANGLE. THIS DATA WILL ALSO BE AVAILABLE FOR RECORDING.

ADVANCED COMPOSITE PRODUCTS, INC. 37 WASHINGTON AVENUE E. HAVEN, CT 06512 DAVID MAASS TITLE: AIRBORNE COMPOSITE WAVEGUIDE DEVELOPMENT TOPIC: 12d OFFICE: AFWAL/XRPA	AF	\$ 67,020
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THIS PROGRAM SEEKS TO DEVELOP LIGHTWEIGHT GRAPHITE COMPOSITE WAVEGUIDES THAT ARE MECHANICALLY AND ELECTRICALLY EQUIVALENT OR SUPERIOR TO STANDARD ALUMINUM WAVEGUIDE. THE COMPOSITE WAVEGUIDE WILL BE DEVELOPED USING A RECOVERABLE MANDREL TECHNIQUE. A RECOVERABLE MANDREL WILL BE MADE AND COATED WITH A HIGHLY CONDUCTIVE COATING. THE GRAPHITE MATERIAL WILL THEN BE APPLIED TO THE COATED MANDREL AND THE MANDREL REMOVED. EMPHASIS WILL BE PLACED ON THE SELECTION AND THE PROCESS OF APPLYING THE MANDREL COATING WHICH IS THE INTERIOR OF THE WAVEGUIDE. THIS COATING MUST NOT ONLY BE HIGHLY CONDUCTIVE BUT ALSO POSSESS A VERY LOW RMS SURFACE FINISH AND ADHERE TO THE GRAPHITE COMPOSITE. TO DEMONSTRATE THE FEASIBILITY OF COMPOSITE WAVEGUIDE, A FOUR FOOT STRAIGHT SECTION AND A CURVED SECTION OF X - BAND (8 TO

FISCAL YEAR 1983

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12.4 GHz) GRAPHITE WAVEGUIDE WILL BE PRODUCED. THE ANTICIPATED BENEFITS OF COMPOSITE WAVEGUIDES ARE LOW WEIGHT AND POSSIBLY IMPROVED PERFORMANCE.

ADVANCED FUEL RESEARCH, INC. 87 CHURCH STREET EAST HARTFORD, CT 06108 PETER R. SOLOMON TITLE: EXPERIMENTS AND MODELING OF MULTI-COMPONENT FUEL BEHAVIOR IN COMBUSTION TOPIC: 13e	AF	\$ 69,754
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OFFICE: AFWAL/XRP-PO

THE OBJECTIVE IS TO SATISFY AIR FORCE REQUIREMENTS TO IMPROVE AVIATION GAS TURBINES AND TO PROVIDE FOR THE USE OF ALTERNATIVE FUELS. IT IS DESIRABLE TO DEVELOP CAPABILITIES TO MODEL THE COMBUSTION OF SPRAYS OF MULTI-COMPONENTS FUELS, INCLUDING FUELS WITH HIGHER BOILING FRACTIONS AND AROMATIC AND HETEROATOM COMPONENTS. THE COMBUSTION OF SUCH FUELS ADDS SUBSTANTIAL COMPLEXITIES TO THE FUEL VOLATILIZATION AND INCREASES THE POTENTIAL FOR HIGHER RADIATIVE EMISSION FROM SOOT, REDUCING THE USEFUL LIFE OF TURBINE COMBUSTORS. IT IS PROPOSED IN PHASE I THAT MULTI-COMPONENT FUEL DROP STREAMS BE STUDIED AT TEMPERATURES UP TO 1400 DEGREES C, IN BOTH INERT AND REACTIVE ATMOSPHERES. THIS IS TO BE DONE IN A UNIQUE, CONTRACTOR-OWNED ENTRAINED FLOW REACTOR USING FOURIER TRANSFORM INFRARED SPECTROSCOPY WITH ON-LINE, IN-SITU ANALYSIS OF VOLATILE SPECIES AND TEMPERATURE AND RADIATION ABSORPTION CHARACTERISTICS. THESE DATA WILL BE USED TO EVALUATE THE APPLICATION OF EXISTING CONTRACTOR-DEVELOPED MODELS OF VAPORIZATION, PYROLYSIS AND TRANSPORT TO MULTI-COMPONENT DROPLETS IN COMBUSTION. IN PHASE II, THE WORK WILL BE EXTENDED TO STUDY WELL CHARACTERIZED SPRAYS AT PRESSURES UP TO 10 ATMOSPHERES AND THE INDIVIDUAL MODELS WILL BE INTEGRATED INTO A COMPREHENSIVE FUEL COMBUSTION MODEL CAPABLE OF PROVIDING NEEDED INPUT TO LARGE SCALE COMPUTER CODES OF TWO PHASE REACTING FLOWS.

ADVANCED INFORMATION & DECISION SYSTEMS 201 SAN ANTONIO CIRCLE, SUITE 286 MOUNTAIN VIEW, CA 94040 JAMES R. PAYNE TITLE: OFFENSIVE COUNTER AIR MISSION PLANNING TOPIC: 9g	AF	\$ 70,000
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OFFICE: DORP, COAD

THE OBJECTIVE IS TO ASSESS THE FEASIBILITY OF INTEGRATING DECISION ANALYSIS, ARTIFICIAL INTELLIGENCE AND OPERATIONS RESEARCH PLANNING AIDS INTO AN INTEGRATED SET OF AIDS FOR PERFORMING FUNCTIONS IN OCA MISSION PLANNING, FROM THE TARGET NOMINATION LEVEL DOWN THOROUGH THE

FISCAL YEAR 1983

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SPECIFIC ROUTE PLANNING LEVEL. PHASE I EFFORT WILL EMPHASIZE TECHNOLOGY ISSUES RATHER THAN ENGINEERING DESIGN AND BUILD ISSUES. THE ANALYSIS WILL USE BOTH A TOP DOWN THEM AND A BOTTOM UP APPROACH. THE REQUIREMENTS AND ARCHITECTURAL ASPECTS WILL BE EXPLORED FROM THE MORE ENCOMPASSING PERSPECTIVE OF THE TOTAL MISSION PLANNING ENVIRONMENT OF AN ATAF. THE RESULTING STRUCTURE WILL PROVIDE SOFT CONSTRAINTS DURING OUR MORE DETAILED EXPERIMENTATION WITH SPECIFIC AIDS. WE WILL EXPERIMENT WITH COMBINING THE EXISTING (RESEARCH) AIDS (TARGET PRIORITIZATION AID (TPA), KNOBS, AND ROUTH PLANNING AID (RPA)) THAT HAVE BEEN INDIVIDUALLY DEVELOPED FOR DIFFERENCE LEVELS OF THE OCA PLANNING PROCESS. RESEARCH ISSUES WILL INCLUDE PERFORMANCE MEASURES, SYSTEM ARCHITECTURE, LEVELS OF DATA/INFORMATION AGGREGATION (DEGREES OF DETAIL), FEEDBACK, DISTRIBUTED DATA BASES MANAGEMENT, AND MAN-MACHINE INTERFACE.

ADVANCED INFORMATION & DECISION SYSTEMS 201 SAN ANTONIO CIRCLE, SUTIE 286 MOUNTAIN VIEW, CA 94040 ROBERT J. DRAZOVICH TITLE: KNOWLEDGE BASED INTELLIGENCE DATA ANALYSIS TOPIC: 1a	ARMY	\$124,970
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THIS RESEARCH WILL ANALYZE THE USE OF ARTIFICIAL INTELLIGENCE TECHNOLOGY TO HELP IN THE AUTOMATION OF TACTICAL INTELLIGENCE DATA ANALYSIS. THIS INVOLVES ACCOMPLISHING AUTOMATED SCENE ANALYSIS AND SITUATION ASSESSMENT THROUGH THE USE OF MESSAGE-LEVEL DATA ANALYSIS AND MULTI-SOURCE INFORMATION CORRELATION AND FUSION. THE PHASE I EFFORT WILL CONCENTRATE ON TECHNIQUE DEVELOPMENT AND ANALYSIS, FEASIBILITY ASSESSMENT AND ON AI SYSTEM DESIGN. PHASE II WILL PRODUCE A PROTOTYPE SYSTEM. THE PHASE I EFFORT WILL ANALYZE AND DESIGN THE KEY COMPONENTS OF AN AI APPROACH TO INFORMATION FUSION INCLUDING KNOWLEDGE ORGANIZATION, HYPOTHESIS REPRESENTATIVES, DOMAIN KNOWLEDGE REPRESENTATION, HYPOTHESIS MANAGEMENT AND PROCESS CONTROL. ISSUES INVOLVED IN THE REPRESENTATION OF BOTH SPATIAL AND TEMPORAL KNOWLEDGE REQUIRED TO ACCOMPLISH TACTICAL INFORMATION FRUSION WILL BE OF PARTICULAR CONCERN. THE EFFORT WILL CONCENTRATE ON DESIGNING AN AI FUSION SYSTEM THAT CAN BE INCORPORATED INTO THE EVOLVING HARDWARE/SOFTWARE TESTBED ENVIRONMENT BEING ESTABLISHED AT THE ARMY'S

FISCAL YEAR 1983

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SIGNAL WARFARE LABORATORY. THIS INCLUDES INTERFACING WITH EXIST- ING (OR UNDER DEVELOPMENT) SCENARIO DRIVERS AND SINGLE SENSOR ANALYSIS SYSTEMS.		

ADVANCED INFORMATION & DECISION SYSTEMS 201 SAN ANTONIO CIRCLE, SUITE 286 MOUNTAIN VIEW, CA 94940 J.R. PAYNE/D.G. SHAPIRO TITLE: DISTRIBUTED PROCESSING FOR BALLISTIC DEFENSE SYSTEMS TOPIC: 8c OFFICE: BMDSC	ARMY	\$ 49,615
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THE OBJECTIVE OF THIS STUDY IS THE DEVELOPMENT OF TOOLS AND TECH-
NIQUES DESIGNED TO AID IN THE ABILITY TO DEVELOP DISTRIBUTED COMPUTING
SYSTEMS FOR REAL-TIME ENVIRONMENT. THE INITIAL INVESTIGATION WILL
FOCUS ON THE DEVELOPMENT AND EVALUATION OF INTERCEPTOR MANAGEMENT
ALGORITHMS USING ARTIFICIAL INTELLIGENCE PLANNING TECHNIQUES. THE
WORK TO BE PERFORMED DURING PHASE I WILL INCLUDE DEVELOPING AN OVERALL
ALGORITHM CONTROL STRUCTURE, DEVELOPING THE INTERCEPTOR MANAGEMENT
ALGORITHMS AND CODING AND TESTING A PORTION OF IT.

ADVANCED INFORMATION & DECISIONS SYSTEMS 201 SAN ANTONIO CIRCLE, SUITE 286 MOUNTAIN VIEW, CA 94040 DARWIN KUAN TITLE: LINEAR FEATURE EXTRACTION FROM RADAR IMAGERY TOPIC: 1t OFFICE: CDR,ETL	ARMY	\$107,913
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AI&DS IS PROPOSING TO DEVELOP AN AUTOMATED SYSTEM FOR DETECTING AND
CLASSIFYING LINEAR TERRAIN FEATURES IN SAR IMAGERY. IN THE PHASE I
RESEARCH, WE WILL UNDERTAKE A FEASIBILITY ANALYSIS OF SUCH A SYSTEM
AND DEVELOP AND TEST KEY SYSTEM COMPONENTS ON A FEW LINEAR FEATURES
(ROADS, RIVERS, RAILROADS, BRIDGES). THE APPROACH IS TO DEVELOP AN
AI KNOWLEDGE-BASED SYSTEM THAT CONSISTS OF GEOGRAPHICAL TERRAIN INFOR-
MATION (MAP) AND THE RULES USED BY HUMAN ANALYSIS (CONTEXTUAL AND TASK
DEPENDENT INFORMATION) TO INTERPRET RADAR IMAGES. THE PHASE ONE

FISCAL YEAR 1983

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EFFORT WILL ANALYZE AND DESIGN THE KEY COMPONENTS IN THE SYSTEM: SPECIAL FEATURE OPERATOR DESIGN AND SELECTION, RULE-BASED FEATURE INTEGRATION, TRACKING AND OVERALL PROCESSING CONTROL. EMPHASIS WILL BE PLACED ON DETECTION OF A SPECIFIC GROUP OF LINEAR FEATURES, I.E. ROADS, RIVERS, RAILROADS, AND BRIDGES. THE PHASE 2 EFFORT WIL BE DIRECTED AT BUILDING A WORKING EXPERIMENTAL SYSTEM. BOTH LINEAR FEATURES AND TEXTURED REGIONS (FOREST, LAKE, CITY, FARM LAND) WILL BE CONSIDERED.

ADVANCED MECHANICAL TECHNOLOGY, INC. 141 CALIFORNIA STREET NEWTON, MA 02158 ELIA P. DEMETRI TITLE: DEVELOPMENT OF A MODEL FOR HOT-SURFACE IGNITION OF COMBUSTIBLE LIQUIDS TOPIC: 13e	AF	\$ 49,896
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OFFICE: AFWAL/XRP-PO

THERE ARE MANY MILITARY SYSTEMS REQUIRING THE STORAGE AND USE OF COMBUSTIBLE LIQUIDS. VARIOUS SCENARIOS ARE POSSIBLE IN WHICH THE LIQUID IS ACCIDENTALLY RELEASED SUCH THAT IT CONTRACTS A HOT SURFACE, RESULTING IN A POTENTIAL FIRE OR EXPLOSION HAZARD. THE OPTIMUM DESIGN OF APPROPRIATE SAFETY MEASURES IS SEVERELY HAMPERED BY THE FACT THAT THE THERMAL IGNITION OF LIQUIDS IS A PHENOMENON WHICH IS NOT WELL UNDERSTOOD, NOR IS THERE ANY USEFUL EMPIRICAL INFORMATION ON THE PROCESS. THE PROPOSED RESEARCH FOCUSES ON FILLING THIS GAP IN KNOWLEDGE. THE OBJECTIVE WILL BE TO DEVELOP AND EXPERIMENTALLY VERIFY A MODEL OF THE HOT-SURFACE IGNITION PHENOMENON FOR COMBUSTIBLE LIQUIDS. THIS WILL BE ACCOMPLISHED BY CONDUCTING A COMBINED ANALYTICAL AND EXPERIMENTAL RESEARCH EFFORT LEADING TO A MODEL CAPABLE OF PREDICTING THE CRITICAL IGNITION TEMPERATURE AS A FUNCTION OF DEFINABLE SYSTEM PARAMETERS. THE APPROACH TO BE FOLLOWED CONSISTS OF EXTENDING TO THE CASE OF LIQUIDS AN EXISTING IGNITION MODEL AND EXPERIMENTAL PROCEDURE WHICH HAVE PROVEN SUCCESSFUL IN DEALING WITH THE CASE OF FLAMMABLE GAS MIXTURES.

ADVANCED MECHANICAL TECHNOLOGY, INC. 141 CALIFORNIA STREET NEWTON, MA 02158 ELIA P. DEMETRI TITLE: HIGH EFFECTIVENESS AIR-COOLED HEAT EXCHANGER CAPABLE OF OPERATING IN DUSTY ENVIRONMENTS TOPIC: 5f	ARMY	\$ 49,748
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OFFICE: TACOM

THERE ARE MANY COMBAT VEHICLE AND EQUIPMENT APPLICATIONS WHERE AN AIR-COOLED HEAT EXCHANGER MUST OPERATE IN AN ENVIRONMENT WITH HIGH CONCENTRATIONS OF SAND AND DIRT IN THE AMBIENT AIR. CONVENTIONAL COMPACT HEAT EXCHANGERS ARE SUSCEPTIBLE TO CLOGGING OF COOLING FINS. ONE

FISCAL YEAR 1983

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APPROACH THAT MAY OFFER SIGNIFICANT ADVANTAGES AND INCREASED PREFORMANCE IN THIS ENVIRONMENT IS THAT OF A FLUIDIZED BED HEAT EXCHANGER. THE PROPOSED PROGRAM WILL SET OUT TO DEFINE THE DEGREE OF TOLERANCE TO ENVIRONMENTAL CONDITIONS ANDD ENHANCEMENT OF HEAT TRANSFER PERFORMANCE OBTAINABLE IN A LABORATORY MODEL. THE ANALYSIS OF THE RESULTS WILL BE USED TO IDENTIFY PROMISING APPLICATIONS FOR THE FULL SCALE IMPLEMENTATION OF THE DEVELOPED TECHNOLOGY.

ADVANCED RESEARCH & APPLICATION CORP. 1223 E. ARQUES AVENUE SUNNYVALE, CA 94086 T. J. MAGEE, MGR. TITLE: ELIMINATION OF EXCESSIVE SURFACE DEFECTS IN GaAs IC MATERIAL USING NON-CONTACT POLISHING TOPIC: 7	DARPA	\$ 48,029
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THE EXTENSION OF A NON-CONTACT POLISHING TECHNIQUE, PREVIOUSLY DEVELOPED FOR IT-VI COMPOUNDS, IS PROPOSED FOR (100) GAAS WAFERS INTEGRATED CIRCUIT APPLICATIONS IN MIND. AN INITIAL TASK WILL BE TO CHARACTERIZE SUCH NON-CONTACT POLISHED SURFACES AND COMPARE THEM WITH CONVENTIONALLY POLISHED SURFACES. FOLLOWING SUCCESSFUL DEVELOPMENT OF THE TECHNIQUE, THE FEASIBILITY OF SCALE-UP FOR POLISHING THREE-INCH WAFER FOR PHASE II IMPLEMENTATION WILL BE INVESTIGATED.

ADVANCED RESEARCH & APPLICATIONS CORP. 1223 E. ARQUES AVENUE SUNNYVALE, CA 94086 DR. JAMES H. STANLEY TITLE: A NEW NDE CAPABILITY FOR THIN-SHELLED STRUCTURES TOPIC: 11h	AF	\$ 49,842
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A POWERFUL, NOW IMAGING MODALITY IDEALLY SUITED FOR THIN-SHELLED STRUCTURES BUT CONSIDERABLY MORE GENERAL IN NATURE IS PROPOSED. THE APPROACH IS BASED ON WELL-ESTABLISHED DIGITAL TOMOSYNTHESIS PRINCIPLES AND MODERN REAL-TIME DIGITAL RADIOGRAPHY TECHNIQUES.

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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A SERIES OF COMPONENT RADIOGRAPHS OF A STRUCTURE TAKEN FROM DIFFERENT ANGLES ARE MANIPULATED ACCORDING TO A RESTORATIVE ALGORITHM TO RECOVER A SET OF IMAGES OF PARALLEL SURFACES WITHIN THE OBJECT. THE METHOD IS COMPLEMENTARY TO COMPUTED TOMOGRAPHY (CT); BUT WHEREAS CT PRODUCES IMAGES OF PLANAR SURFACES PARALLEL TO THE DIRECTION OF THE X-RAY FLUX. THE PROPOSED APPROACH PRODUCES IMAGES OF ARBITRARY CURVILINEAR SURFACES NORMAL TO THE X-RAY FLUX. CONSEQUENTLY, THE PROPOSED INSTRUMENT, WHICH HAS BEEN DESIGNATED A DIGITAL TOMOGRAPH (DT), IS SUPERBLY TAILORED FOR NON-DESTRUCTIVELY EVALUATING STRUCTURES WHICH ARE FABRICATED IN A LAMINAR OR MULTI-LAYER FASHION. THE ABILITY TO IMAGE TOMOGRAPHIC SURFACES WITHIN AND CONCENTRIC TO THE NATURAL SHAPE OF THE OBJECT PROVIDES A SUPERIOR INSPECTION CAPABILITY THAT CANNOT CURRENTLY BE MATCHED BY ANY OTHER NDE METHOD, INCLUDING CT.

ADVANCED RESEARCH AND APPLICATION CORP. 1223 EAST ARQUES AVENUE SUNNYVALE, CA 94086 L. J. PALKUTI TITLE: LASER ASSISTED CVD OF HgCdTe (CHEMICAL VAPOR DEPOSITION) TOPIC: In	ARMY	\$ 50,000
OFFICE: ERADCOM		

A DEMONSTRATION OF THE FEASIBILITY OF A LASER-ASSISTED CHEMICAL VAPOR DEPOSITION PROCESS FOR MERCURY CADMIUM TELLURIDE FILMS UTILIZING LARGE AREA, UNIFORM RARE-GAS HALIDE EXCIMER LASER ILLUMINATION IS PROPOSED. AN INITIAL TASK FROM THIS PURPOSE WILL BE TO CONDUCT A TRADEOFF STUDY TO DETERMINE THE OPTIMUM GEOMETRY FOR LACVD. THIS WILL BE FOLLOWED BY THE TASK OF DESIGNING, BUILDING AND TESTING AN APPROPRIATE GAS-FLOW SYSTEM AND DEPOSITION CHAMBER FOR LACVD GROWTH OF SUCH FILMS WE WILL CHARACTERIZE THEM USING AN ARRAY OF TECHNIQUES INCLUDING SECONDARY ION MASS SPECTROMETRY, TRANSMISSION ELECTRON MICROSCOPY AND SYNCHROTRON X-RAY TOPOGRAPHY, WE WILL ALSO INVESTIGATE GRADED STOICHIOMETRY FILMS.

ADVANCED TECHNOLOGY AND RESEARCH, INC. 8508 ADELPHI ROAD HYATTSVILLE, MD 20783 DR. JIGIEN CHEN TITLE: TRACKING PROGRESSIVE FRACTURE/TOWARDS RETIREMENT FOR CAUSE TOPIC: 10a	AF	\$ 69,979
OFFICE: AFWAL/XRPF		

ONE OF THE MOST COMMON PROBLEMS IN THE FIELDS OF SYSTEM DYNAMICS AND PATTERN RECOGNITION IS THE IDENTIFICATION OF THE DYNAMIC CHARACTERISTICS OF SYSTEMS. IF THE DYNAMIC CHARACTERISTICS OF A SYSTEM ARE KNOWN THEN AN ACCURATE MATHEMATICAL MODEL COULD BE CONSTRUCTED AND A

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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BETTER UNDERSTANDING OF THE BEHAVIOR OF THE SYSTEM COULD BE DEVELOPED. THIS WOULD HELP IMPROVE ITS DESIGN AND PERFORMANCE, MAKE ITS IDENTIFICATION EASIER, FACILITATE INSPECTION, AND NON-DESTRUCTIVE TESTING AND EVALUATION. THE MAIN OBJECTIVE OF THIS WORK IS TO DEVELOP NEW AND MORE ACCURATE DYNAMIC SYSTEM IDENTIFICATION TECHNIQUES FOR SYSTEMS WITH HIGH MODAL DENSITY. THESE ARE SYSTEMS WITH MODEL FREQUENCIES CLOSE TO EACH OTHER SO THAT CONVENTIONAL IDENTIFICATION TECHNIQUES CANNOT BE APPLIED. IN THIS RESEARCH EFFORT WE PROPOSE TO CONCENTRATE ON THE DEVELOPMENT OF THE RANDOM DECREMENT SYSTEM IDENTIFICATION TECHNIQUE. THE TECHNIQUE WILL BE DEVELOPED SO THAT IT CAN BE APPLIED TO ANY TYPE OF SYSTEM IF SUFFICIENT RESPONSE DATA ARE PROVIDED IN ANALOG OR DIGITAL FORM. POSSIBLE SOURCES OF ERROR WILL BE IDENTIFIED AND CORRECTION ALGORITHMS WILL BE TESTED.

ADVANCED TECHNOLOGY LABORATORIES, INC.	AF	\$ 70,000
8027 LEESBURG PIKE, SUITE 700		
VIENNA, VA 22180		
DR. MARC A. FRIEDLANDER		
TITLE:		
RESEARCH ON AN OPTICAL MEMORY DEVICE TECHNOLOGY FOR SPACECRAFT		
TOPIC: 14g	OFFICE: SD//YLXT	

WE WILL PERFORM RESEARCH INTO AN OPTICAL MEMORY DEVICE TECHNOLOGY WHICH SHOWS THE POTENTIAL OF PROVIDING A REPLACEMENT FOR MECHANICAL-MAGNETIC TAPE RECORDERS CURRENTLY USED IN SPACECRAFT, BUT WITH SIGNIFICANTLY HIGHER RELIABILITY. THE TECHNOLOGY IS BASED ON THE PHOTON ECHO PHENOMENON, AND PROVIDES STORAGE CAPACITY INCREASES (UP TO 10 (15) BITS) AS WELL AS THE REQUIRED CONTINUOUS OPERATION OF SEVEN YEARS WITHOUT EXTERNAL MAINTENANCE, NON-DESTRUCTIVE READOUT, PROVISION FOR INCORPORATING SECURITY SAFEGUARDS, RADIATION HARDENING, IMPROVED ACCESS TIME, COMPATIBILITY WITH MAGNETIC RECORDERS ON EXISTING SPACE SYSTEMS, AND THE POTENTIAL FOR SPACE QUALIFICATION. WE WILL PERFORM A STATE-OF-THE-ART SURVEY OF THE TECHNOLOGIES AND MATERIALS ON WHICH THE FEASIBILITY OF A PHOTON ECHO MEMORY DEPENDS, INCLUDING DETAILED ANALYSES OF SYSTEM PARAMETERS. WE WILL ALSO DEVELOP A PLAN FOR THE CONDUCT OF PHASE II OF THE PROJECT, INCLUDING A DELINEATION OF RESOURCES. THE PHOTON ECHO MEMORY IS ULTIMATELY INTENDED TO BE INTERFACED WITH THE RESULTS OF CURRENT AND PROPOSED

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>LARGE SCALE R&D PROGRAMS DIRECTED TO ADVANCING THE STATE-OF-THE-ART OF COMPUTER SYSTEMS, E.G., THE VERY HIGH SPEED INTEGRATED CIRCUIT (VHSIC) PROGRAM, OPTICAL SWITCHING RESEARCH, AND THE RECENT GOVERNMENT RESPONSE TO THE JAPANESE 5TH GENERATION COMPUTER PROGRAM.</p>		
<p>AERODYNE RESEARCH, INC 45 MANNING ROAD BILLERICA, MA 01821 DR KURT D ANNEN TITLE: A PULSED SOLAR-BRAYTON CYCLE SPACE POWER SYSTEM TOPIC: 13 OFFICE: AFWAL/XRP-PO</p>	<p>AF</p>	<p>\$ 49,977</p>

THE OBJECT OF THE PROPOSED STUDY IS TO CONDUCT AN EVALUATION OF THE FEASIBILITY AND PREDICTED PERFORMANCE OF A CLASS OF PULSED SPACE POWER SYSTEMS CHARACTERIZED BY THE USE OF (A) INTER-PULSE ENERGY STORAGE IN FLYWHEELS, (B) THERMAL STORAGE FOR INTERMEDIATE TIMES (1 HOUR), (C) A SOLAR-DRIVEN CLOSED BRAYTON CYCLE WITH CERAMIC COMPONENTS AND HIGH PEAK TEMPERATURE. NUCLEAR SOURCES COULD BE SUBSTITUTED FOR THE SOLAR HEAT. THIS TYPE OF SYSTEM IS OF INTEREST FOR SPACE-BASED LASERS AND FOR CERTAIN ELECTRIC PROPULSION APPLICATIONS. PRELIMINARY ESTIMATES INDICATE A STRONG POTENTIAL FOR LIGHT-WEIGHT, LONG LIFE AND OPERATIONAL FLEXIBILITY. THE STUDY WOULD CONSIST OF A COMBINATION OF SYSTEM OPTIMIZATION AND CRITICAL COMPONENT DESIGN AND MATERIAL SELECTION EVALUATION STUDIES.

<p>AERODYNE RESEARCH, INC. 45 MANNING ROAD BILLERICA, MA 01821 DR. JOHN GRUNINGER TITLE: INTELLIGENT IMAGE INTERPRETATION BY SYNTHESIS TOPIC: 9f OFFICE: RADC//DORP</p>	<p>AF</p>	<p>\$ 49,978</p>
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WE PROPOSE TO COMBINE THE TOOLS OF IMAGE GENERATION, STATISTICAL IMAGE ANALYSIS AND TARGET RECOGNITION CUES TO PRODUCE AN AUTOMATIC IMAGE INTERPRETER WHICH CAN BE APPLICABLE TO REALISTIC IDENTIFICATION TASKS. REALISTIC IMAGES CONTAIN AMBIGUITIES DUE TO MULTIPLE

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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OBJECTS, SHADOWS, DECOYS, OBSCURATION AND DEIBERATE CAMOUFLAGE. OUR STRATEGY IS TO DEVELOP AN EXPERT SYSTEM WHICH WILL DRIVE THE INTERPRETATION PROCESS. IT WILL USE A ROBUST STATISTICAL PATTERN RECOGNITION APPROACH TO GIVE A SET OF POSSIBLE TARGETS ALONG WITH PREDICTED SCALE AND ORIENTATION INFORMATION. THE OUTPUT SCORES FROM THE STATISTICAL RECOGNIZER ARE GIVEN A FUZZY SET INTERPRETATION AND ARE TREATED AS INPUT TO THE IMAGE SYNTHESIS MODULE. AERODYNE'S IMAGE SYNTHESIS MODULE WILL BE USED TO GENERATE IMAGES SIMULATING THE PROBABLE SCENES. AN EXPERT SYSTEM WILL CALL ON THE SYNTHESIS MODULE TO SEARCH FOR INCONSISTENCIES IN GEOMETRY AND GREY LEVEL SHADING, IDENTIFY SHADOWS AND DECOYS. THE EXPERT SYSTEM WILL PRODUCE THE FINAL INTERPRETATION OF THE INPUT IMAGE. EFFORTS IN PHASE I ARE DIRECTED TOWARD DEFINING THE NATURE OF THE TARGET IDENTIFICATION RULES AND DEFINES CUES FOR RESOLVING CONFLICTS BETWEEN CONSISTENT SYNTHETIC SCENES AND THE INPUT IMAGE.

AIRTECH PRECISION SHOT PEENING, INC.	AF	\$ 37,324
36656 COMMERCE RD.		
LIVONIA, MI 48150		
ROGER S. SIMPSON		

TITLE:

DEVELOPMENT OF A MATHEMATICAL MODEL FOR PREDICTING THE PERCENTAGE FATIGUE LIFE INCREASE RESULTING FROM SHOT PEENED COMPONENTS

TOPIC: 10a OFFICE: AFWAL/XRPF

CURRENT SHOT PEENING TECHNOLOGY DOES NOT OFFER THE CAPABILITY TO ACCURATELY PREDICT FATIGUE LIFE BENIFITS. RECENT TEST RESULTS IDENTIFY A HERETOFORE UNDOCUMENTED SURFACE INTEGRITY PHENOMENOM ASSOCIATED WITH PEENING AT RELATIVELY HIGH INTENSITIES WHICH HAS BEEN LINKED TO PREMATURE SPECIMEN FAILURE AT FATIGUE LIFE LOWER THAN THAT OF UNPEENED SPECIMEN. DATA PRESENTED BY SEVERAL AUTHORS AT THE FIRST INTERNATIONAL SHOT PEENING SYMPOSIUM INDICATES THAT CURRENT MILITARY AND INDUSTRY SPECIFICATIONS CONCERNING SUGGESTED SHOT PEENING LEVELS ARE LARGELY INADEQUATE AND MAY IN SOME CASES BE DAMAGING TO FATIGUE LIFE AND STRESS CORROSION RESISTANCE. A METHOD IS PROPOSED FOR DEVELOPING A MATHEMATICAL MODEL WHICH WOULD BE CAPABLE OF PREDICTING THE PERCENTAGE OF FATIGUE LIFE INCREASE THAT COULD BE OBTAINED FROM PEENING, AND WHAT PEENING PERAMETERS AND PEENING INTENSITY CORRELATED WITH OPTIMUM FATIGUE LIFE. PEENING TEST PARAMETERS AND DESTRUCTIVE TESTING ALONG WITH CORRELATIONS NECESSARY ARE LISTED.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
ALM, INC. 1745 S. JEFFERSON DAVIS HIGHWAY, STE 900 ARLINGTON, VA 22202 WILLIAM F. FRIZZELL TITLE: LASER SPECTROSCOPY FOR CLINICAL DENTAL DIAGNOSIS TOPIC: 6q OFFICE: MRDC	ARMY	\$ 34,290

TRANSILLUMINATION OF DENTAL STRUCTURES AND GINGIVAE BY VISIBLE WAVELENGTH LASER LIGHT DIAGNOSE DENTAL AND PARA-ORAL CAVITY ABNORMALITIES IS PROPOSED. IN ADDITION, LASER SPECTROSCOPY OF RELATED DENTAL STRUCTURES AND TISSUE SHALL BE PERFORMED TO DETERMINE THE LASER WAVELENGTHS BEST SUITED TO IDENTIFICATION OF A WIDE RANGE OF DENTAL FEATURES. ALSO, LASER POWER VS. WAVELENGTH WILL BE DETERMINED FOR EFFECTIVE DIAGNOSIS, KEEPING SAFETY CRITERIA IN MIND. STANDARD SPECTROSCOPIC TECHNIQUES, WELL DOCUMENTED IN SPECTROSCOPY LITERATURE, SHALL BE USED. A CLINICAL DENTIST SHALL PROVIDE THE FINAL AUTHORITATIVE EVALUATION OF THE DIAGNOSTIC CAPABILITY OF THE LASER TRANSILLUMINATION AT VARIOUS WAVELENGTHS AND OUTPUT POWER LEVELS. THE PROPOSED STUDY WILL PROVIDE CLINICAL DATA AND INSTRUMENTATION DESIGN CRITERIA WHICH MAY SUPPLEMENT DENTAL RADIOGRAPHS BY PROVIDING REAL-TIME, IN SITU LASER TRANSILLUMINATION OF DENTAL CARIOUS LESIONS, AS WELL AS OUTLINING VARIOUS PERIODONTAL AND ORAL SURGERY APPLICATIONS. WHILE NOT INTENDED TO COMPLETELY REPLACE RADIOGRAPHS, THE RESEARCH AS OUTLINED HEREIN SHOULD PROVIDE A UNIQUE, YET SIMPLE, METHOD OF INTER-ORAL IDENTIFICATION WITHIN THE FIELD OF CLINICAL DENTISTRY WITHOUT THE NECESSITY OF EXPOSING A PATIENT TO ANY FORM OF IONIC RADIATION.

AMERCOM, INC. 8948 FULLBRIGHT AVENUE CHATSWORTH, CA 91311 CURTIS V. BURKLAND TITLE: A HIGH TEMPERATURE CERAMIC COMPOSITE TOPIC: 11d OFFICE: AFWAL/XRPM	AF	\$ 65,850
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THERE IS A NEED FOR A GOOD STRUCTURAL CERAMIC MATERIAL THAT CAN BE USED AT HIGH TEMPERATURES IN THE OXIDIZING AND CORROSIVE ATMOSPHERE OF TURBINE ENGINES AND THAT CAN BE FORMED ECONOMICALLY TO COMPLEX SHAPES WITH LOW WEIGHT. THE OBJECTIVE OF THIS RESEARCH PROJECT

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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IS TO INVESTIGATE A NEW FAMILY OF CERAMIC COMPOSITE MATERIALS THAT MAY MEET THOSE REQUIREMENTS. IT IS BASED ON CHEMICALLY VAPOR DEPOSITED (CVD) SILICON CARBIDE AS THE MATRIX, REINFORCED BY A CERAMIC TEXTILE PREFORM. THE PREFORM IS WOVEN TO NET SHAPE AND INFILTRATED WITH SILICON CARBIDE IN A GAS PHASE REACTION. THIS PROGRAM INCLUDES THE EVALUATION OF SEVERAL TYPES OF FIBERS AND FABRICS FOR SUCH A COMPOSITE; THE FABRICATION OF TEST SAMPLES; AND TESTING TO OBTAIN THERMAL, OXIDATION, AND MECHANICAL PROPERTY DATA.

AMERICAN RESEARCH CORPORATION OF VA. 642 FIRST STREET, P.O. BOX 3406 RADFORD, VA 24143 DR. R. J. CHURCHILL TITLE: ELECTROMAGNETIC DETECTION OF STRESS AND CRACK PROPAGATION IN CRITICAL AIRCRAFT COMPONENTS TOPIC: 99	NAVY	\$ 44,380
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NON-DESTRUCTIVE TESTING RESEARCH HAS BEEN PRIMARILY CONCERNED WITH DEFECT DETECTION AND CHARACTERIZATION WITH RELATIVELY LITTLE EFFORT ON NDT TECHNIQUES FOR MEASURING STRESS, PREDICTING FATIGUE DAMAGE PRIOR TO CRACKING AND MONITORING OF CRACK PROPAGATION IN CRITICAL AIRCRAFT COMPONENTS. THESE PROBLEMS ARE OF SIGNIFICANCE TO THE AIRCRAFT INDUSTRY AND TO THE NAVY BECAUSE OF THE POTENTIAL FAILURE DUE TO STRESS CORROSION CRACKING, INTER-GRANULAR ATTACK, THERMAL SHOCK AND OTHER SERVICE INDUCED MODES. THIS PROGRAM PROPOSES THE APPLICATION OF ELECTROMAGNETIC NDT METHODS TO DETECTION AND MEASUREMENT OF STRESS AND CRACK PROPAGATION IN FERROMAGNETIC AND NON-FERROMAGNETIC MATERIALS. INITIALLY, CONVENTIONAL EDDY CURRENT PROBES WILL BE USED TO DETECT IMPEDANCE CHANGES AS MATERIALS ARE MECHANICALLY LOADED IN A MATERIALS TESTING MACHINE. A MAJOR OBJECTIVE OF THE RESEARCH WILL BE THE CORRELATION OF PROBE IMPEDANCE CHANGES WITH BOTH STRESS LEVEL AND CRACK GROWTH. IN ADDITION, SEVERAL LESS-CONVENTIONAL ELECTROMAGNETIC MEASURING TECHNIQUES WILL BE INVESTIGATED. SUCCESSFUL COMPLETION OF THE PROJECT OBJECTIVES WILL PROVIDE THE AIRCRAFT INDUSTRY WITH A COST-EFFECTIVE, RELIABLE METHOD OF DETERMINING BOTH STRESS LEVELS AND CRACK GROWTH

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
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IN CRITICAL AIRCRAFT COMPONENTS.

AMHERST SYSTEMS, INC 132 CAYUGA ROAD BUFFALO, NY 14225 CHARLES E. DOWDELL TITLE: ECM EFFECTIVENESS ASSESSMENT CONCEPT STUDY TOPIC: 92(1) OFFICE: NESC	NAVY	\$ 46,951
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INFORMATION WHICH CAN BE MEASURED BY THE ELECTRONIC WARFARE SYSTEM IS AVAILABLE TO DETERMINE THE EFFECTIVENESS OF ECM TECHNIQUES AGAINST MANY THREATS. THREATS CHARACTERISTICS AND ECM TECHNIQUES WILL BE EXAMINED TO IDENTIFY THE MEASURABLES. DATA UTILIZATION SCHEMES WILL BE DEFINED AND ASSESSMENT CRITERIA ESTABLISHED TO ACHIEVE THE ASSESSMENT CAPABILITY GOALS. A REFINED ASSESSMENT PROCESS RELATIVE TO THAT PROPOSED WILL BE DESCRIBED AND CONCLUSIONS DRAWN ON CONCEPT FEASIBILITY. IMPLEMENTATION OF THE ASSESSMENT CAPABILITY INTO THE AN/SLQ-32 EW SYSTEM WILL BE EXAMINED AND THE NECESSARY HARDWARE AND PROCESSING ENHANCEMENTS DESCRIBED.

AMTEC ENGINEERING INC. 1506 106TH AVENUE N.E. BELLEVUE, WA 98004 DONALD W. ROBERTS TITLE: THE DEVELOPMENT OF A 3D VISCOUS FLOW ANALYSIS FOR THE EVALUATION OF HYPERSONIC INLETS TOPIC: 33 OFFICE: NSSC	NAVY	\$ 49,126
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THE NEED EXISTS FOR AN EFFICIENT HYPERSONIC INLET FLOW ANALYSIS CODE THAT WILL CALCULATE BOTH EXTERNAL AND INTERNAL FLOW FIELDS INCLUDING VISCOUS EFFECTS. THE FIRST OBJECTIVE OF THE PROPOSED EFFORT IS TO DEVELOP A PROTOTYPE CODE BASED ON A PARABOLIZED NAVIER-STOKES FORMULATION WITH A 3D PRESSURE EQUATION INCORPORATED IN REGIONS HAVING STRONG STREAMWISE ELLIPTIC EFFECTS. THE SECOND OBJECTIVE IS TO DEMONSTRATE THE CAPABILITY OF THE METHOD TO HANDLE THE CRUCIAL PROBLEM OF CAPTURING THE NORMAL SHOCK IN THE ELLIPTIC REGION IN THE INLET

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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DIFFUSER SECTION. THE APPROACH IS TO DEVELOP A CODE THAT USES AN EFFICIENT MARCHING SOLUTION PROCEDURE. STARTING FROM AN INITIAL DATA PLANE, THE SOLUTION IS MARCHED IN THE DOWNSTREAM DIRECTION. FOR THE EXTERNAL DOMAIN AND A PORTION OF THE INTERNAL DOMAIN A SINGLE MARCHING PASS IS SUFFICIENT SINCE THE FLOW WILL BE AT HIGH SUPERSONIC MACH NUMBERS AND THE SOLUTION WILL BE HYPERBOLIC. IN ELLIPTIC REGIONS MULTIPLE MARCHING PASSES WILL BE ITERATED WITH AN ELLIPTIC 3D PRESSURE EQUATION. AN INLET TEST CASE WITH ADEQUATE EXPERIMENTAL DATA WILL BE USED TO VALIDATE THE CODE FOR NORMAL SHOCK CAPTURING.

ANALYTICS INCORPORATED	AF	\$ 37,615
2500 MARYLAND ROAD		
WILLOW GROVE, PA 19090		
THOMAS MCCANN		
TITLE:		
USER FRIENDLY SOFTWARE SYSTEM FOR APPLICATION OF UNDERLYING LEARNING CURVE ANALYSIS		
TOPIC: 19b	OFFICE: ASD/YZD	

THE UNDERLYING LEARNING CURVE (ULC) ANALYSIS TECHNIQUE CAN OFFER SUBSTANTIAL BENEFIT TO PERSONNEL INVOLVED WITH EVALUATION OF THE EFFECTIVENESS OF MANUFACTURING OPERATIONS. USE OF THE TECHNIQUE IS IMPEDED BY THE AMOUNT OF COMPUTATION REQUIRED AND BY THE LEVEL OF UNDERSTANDING OF THE CONCEPT BY USERS. THE PROJECT WILL DEVELOP A USER FRIENDLY SOFTWARE SYSTEM TO ACCOMPLISH THESE EVALUATIONS AT CONTRACT ADMINISTRATION ORGANIZATIONS (CAO). THE SYSTEM WILL BE MENU DRIVEN AND LEAD THE USER THROUGH THE NECESSARY INPUT DATA GENERATION AND COMPUTATION. THE SYSTEM WILL BE IMPLEMENTED IN A FASHION THAT IT IS TRANSPORTABLE TO THE TYPES OF EQUIPMENT WHICH ARE AVAILABLE IN THE DOD CAOS.

ANALYTICS, INC.	NAVY	\$ 49,097
2634 ROUND HILL LANE		
BLOOMINGTON, IN 47401		
HAROLD A. SABBAGH		
TITLE:		
AN EDDY-CURRENT MODEL AND INVERSION ALGORITHM FOR NONDESTRUCTIVE EVALUATION OF ADVANCED COMPOSITES		
TOPIC: 99	OFFICE: NASC	

THE PROPOSED RESEARCH PROBLEM IS TO DEVELOP A SENSOR, TOGETHER WITH A MATHEMATICAL ALGORITHM, THAT WILL ALLOW THE THREE-DIMENSIONAL QUANTITATIVE EDDY-CURRENT NONDESTRUCTIVE EVALUATION OF MATERIALS AND STRUCTURES. THE APPROACH THAT WE PROPOSE IS BASED ON, AND EXTENDS,

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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WORK ON TWO-DIMENSIONAL EDDY-CURRENT NDE THAT HAS ALREADY BEEN PERFORMED BY ANALYTICS, INC. THAT WORK IS BRIEFLY REVIEWED. THE TECHNICAL OBJECTIVES OF THE PROPOSED RESEARCH ARE: (1) DETERMINE SUITABILITY OF HALL-EFFECT PROBES FOR SENSING EDDY-CURRENTS, (2) DETERMINE OPTIMUM ARRAY OF HALL-EFFECT PROBES FOR THE SENSOR, (3) DETERMINE SUITABILITY OF DISTRIBUTED WINDINGS AND/OR PHASED-ARRAYS FOR SENSING, OR INDUCING, EDDY-CURRENTS, AND (4) EXTEND THE ALGORITHM FOR RECONSTRUCTING FLAWS IN TWO-DIMENSIONS TO THREE-DIMENSIONS. THESE OBJECTIVES ARE MET BY ANALYZING A MODEL SENSOR, WHICH IS DESCRIBED. THE ANALYSIS IS BASED ON CERTAIN INTEGRAL RELATIONS FOR EDDY-CURRENTS. THESE INTEGRALS ARE DERIVED FROM FUNDAMENTAL ELECTROMAGNETIC THEORY, AND ARE THE FOUNDATION FOR OUR INVERSION TECHNIQUE.

ANCO ENGINEERS, INC
9937 JEFFERSON BOULEVARD
CULVER CITY, CA 90230
PAUL IBANEZ

ARMY \$ 54,444

TITLE:

AN INEXPENSIVE PEAK ACCELERATION INDICATOR FOR AIR CRASH
MONITORING

TOPIC: 9C

OFFICE: AVSCOM

THE DOD HAS EXPRESSED AN INTEREST IN A LOW-COST, PASSIVE, SIMPLE, AND SMALL DEVICE OR TECHNIQUE THAT WOULD ALLOW QUANTITATIVE ASSESSMENT OF PEAK ACCELERATION ACHIEVED DURING AN AIR CRASH. THESE DEVICES WOULD BE PLACED IN ALL SERVICE AIRCRAFT AND, IN THE EVENT OF A CRASH, COULD BE USED TO CORRELATE INJURY WITH PEAK ACCELERATION. IT IS PROPOSED HEREIN TO DEVELOP A DEVICE BASED ON SMALL PELLETS OF DIFFERENT DIAMETERS EMBEDDED IN A TRANSPARENT MEDIUM. WHEN EXPOSED TO SHOCK, THE LARGER PELLETS WOULD DISPLACE. BY NOTING WHICH PELLETS MOVE AND WHICH DO NOT, THE PEAK ACCELERATION CAN BE ASCERTAINED. PRELIMINARY EXPERIMENTS HAVE INDICATED THE FEASIBILITY OF THE CONCEPT. PHASE I RESEARCH WOULD INVOLVE CHOICE OF OPTIMAL MEDIA, PELLET CODING/READING TECHNIQUES, DEVICE ISLATION TO ACHIEVE DESIRED FREQUENCY SENSITIVITY, AND CALIBRATION TESTS.

ANCO ENGINEERS, INC.
9937 JEFFERSON BOULEVARD
CULVER CITY, CA 90230
DR. G. BRUCE TAYLOR

AF \$ 49,203

TITLE:

PROJECTILE PULSE GENERATOR

TOPIC: 8c

OFFICE: AFWAL/PRP

A PROJECTILE PULSE GENERATOR (PPG) HAS BEEN CONCEIVED TO SATISFY ANTICIPATED AIR FORCE REQUIEMENTS. THE PPG IS EXPLOSIVELY DRIVEN AND IS INTENDED TO MEET THE REQUIREMENTS STIPULATED IN THE SBIR SOLICITATION: 0.5 MEGAJOULES PER PULSE, 10 PULSE PER SECOND, 10-

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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MICRO SECOND PULSE WIDTH, AND 100-PULSE RUN TIME. THE PROPOSED PHASE I RESEARCH PROGRAM COVERS BOTH DESIGN, FABRICATION, AND TESTING OF A SMALL-SCALE PPG SECTION AND DESIGN SCALE-UP TO ESTABLISH THE CHARACTERISTICS OF THE SPECIFIED 0.5 MEGAJOULE PPG. ALL FEATURES KNOWN TO BE PERTINENT TO FEASIBILITY WILL BE REPORTED.

ANDRULIS RESEARCH CORPORATION	AF	\$ 59,891
7315 WISCONSIN AVENUE, SUITE 650N		
BETHESDA, MD 20814		
EDWARD M. SWEET, PH.D.		
TITLE:		
NOVEL APPROACHES TO FASIL POLYMERS		
TOPIC: 11c	OFFICE: AFWAL/XRPM	

FLUOROALKYLARYLENESILOXANYLENE (FASIL) POLYMERS POSSESS EXCELLENT THERMAL STABILITY, LOW TEMPERATURE ELASTICITY, AND HYDROCARBON SOLVENT RESISTANCE. POLYMERS BASED ON FASIL HAVE EXTENSIVE PROMISE FOR MILITARY AND COMMERCIAL AEROSPACE APPLICATIONS IF THEY COULD BE RELIABLY AND EFFICIENTLY PRODUCED. THE PROGRAM WILL DEVELOP METHODS FOR RELIABLE PREPARATION OF FASIL/POLYMERS ON A ROUTINE BASIS. PHASE I WILL EVALUATE THREE POLYMERIZATION TECHNIQUES. THESE WILL INCLUDE HOMOPOLYMERIZATION OF FASIL-DIOL, CONDENSATION OF HETERO-FUNCTIONAL FASIL MONOMERS, AND RING OPENING POLYMERIZATION OF CYCLIC FASIL MONOMERS. THE NEAR TERM OBJECTIVE IS THE ESTABLISHMENT OF THE OPTIMUM FASIL POLYMERIZATION TECHNIQUE SO THAT ITS SCOPE AND LIMITATIONS CAN BE FULLY CHARACTERIZED IN A PHASE II R&D PROGRAM.

APPLICATIONS RESEARCH CORPORATION	ARMY	\$ 55,967
330 SOUTH LUDLOW STREET		
DAYTON, OH 45402		
RALPH J. MCLEAN		
TITLE:		
LOW COST EXPENDABLE		
TOPIC: 1n	OFFICE: DRDEL-CT	

THE PROPOSED CONCEPT IS A REFLECTOR-EXPANDABLE CONCEPT DESIGNED TO PROVIDE FALSE TARGETS INTO THREAT FIRE CONTROL SENSORS OVER THE ENTIRE FREQUENCY SPECTRUM AND SEVERELY CONFUSE, DRAW FIRE AND ULTIMATELY SAVE ARMY AIRCRAFT AND IN TURN ENHANCE MISSION SUCCESS. THIS PHASE I

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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EFFORT IS CONCERNED WITH IDENTIFYING PRELIMINARY FEASIBILITY OF THE BASIC CONCEPT ANALYTICALLY, AND TO PERFORM SUFFICIENT ANALYSIS TO ESTABLISH DESIGN REQUIREMENTS FOR A PHASE II MODEL DEVELOPMENT AND EXPERIMENTAL DEMONSTRATION.

APPLIED ENERGY SCIENCES, INC. 3652 OLYMPIAD DRIVE LOS ANGELES, CA 90043 JOSEPH G. LOGAN TITLE: NEW LARGE SCALE, HIGH RESOLUTION MULTI-COLOR SOFTWARE DISPLAY CONCEPT TOPIC: 71	ARMY	\$ 49,500
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OFFICE: CORP OF ENG

PROGRESS IN CRT DISPLAY TECHNOLOGY HAS BEEN LIMITED. CONSEQUENTLY, NEW TECHNOLOGIES ARE BEING EXAMINED (E.G. SOLID STATE "FLAT-PANEL" DISPLAYS) THAT MIGHT BE APPLICABLE FOR A LARGE SCALE, HIGH RESOLUTION, MULTI-COLOR SOFTWARE DISPLAY. IN THIS PROPOSAL, A "NEW" APPROACH TO VERY LARGE SCREEN DISPLAY TECHNOLOGY IS SUGGESTED, BASED ON THE UNIQUE PIEZOELECTRIC PROPERTIES OF STRETCHED POLYVINYLIDENE FLOURIDE FILMS. THE OBJECTIVE OF THIS PHASE I PROGRAM IS TO DEMONSTRATE THAT INDIVIDUAL PICTURE ELEMENTS CAN BE DEVELOPED, YIELDING THE NECESSARY GREY-SCALE RANGE, TO FORM THE BASIS FOR LARGE SCREEN DISPLAY AND THAT THESE ELEMENTS CAN ALSO EASILY BE MODIFIED TO INCORPORATE FULL-COLOR DISPLAY.

APPLIED RESEARCH ASSOCIATES, INC. 4917 PROFESSIONAL COURT RALEIGH, NC 27609 WILLIAM L. DUNN TITLE: STUDY OF A NOVEL SHIELDING PRINCIPLE FOR PROTECTION AGAINST INTENSE GAMMA-RAY BEAMS TOPIC: 6	DNA	\$ 56,153
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OFFICE: DDST

STANDARD MONTE CARLO AND FN METHODS FOR RADIATION TRANSPORT WILL BE USED TO STUDY A NEWLY PROPOSED SHIELD CONFIGURATION FOR PROTECTION AGAINST PARALLEL OR SLIGHTLY DIVERGING GAMA RAY BEAMS IN A SPACE (NON-SCATTERING) ENVIRONMENT. THE NEW CONFIGURATION EMPLOYS LAYERED

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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SHIELDS, WITH CONSIDERABLE SEPARATION BETWEEN THE LAYERS, TO SHADOW THE TARGET, OF THE ASSUMPTION THAT THE DIRECTION OF INCIDENCE IS KNOWN. BY SUITABLE CHOICE OF LAYER SEPARATION AND DIMENSIONS MULTIPLE SCATTERING OF PHOTONS TOWARDS THE LINE OF SIGHT CAN BE MINIMIZED AND THE MAXIMUM ATTENUATION, THEORETICALLY ATTAINABLE ONLY WITH ZERO-AREA BEAMS SHOULD BE APPROACHABLE. THE ATTENUATION IS EXPECTED TO EXCEED THAT OF CONVENTIONAL SHIELDS BY A FACTOR OF 10 OR MORE, FOR A GIVEN TOTAL THICKNESS. OPTIMUM CONFIGURATIONS (SPACING, MATERIALS, ETC.) AND POSSIBLE APPLICATIONS TO OTHER RADIATIONS SUCH AS NEUTRONS WILL BE STUDIED. PHASE I STUDIES WILL IDENTIFY THE MOST IMPORTANT GEOMETRICAL AND MATERIAL FACTORS IN THE DESIGN OF OPTIMUM CONFIGURATIONS. EXPERIMENTAL WORK BOTH TO ESTABLISH NEEDED DATA (E.G., RAYLEIGH AND BOUND-ELECTRON COMPTON SCATTERING) AND TO VERIFY COMPUTATIONS MAY BE UNDERTAKEN IN PHASE II, WHOSE PERFORMANCE IS CONTINGENT ON OBTAINING INDICATIONS OF FEASIBILITY DURING PHASE I.

APPLIED RESEARCH, INC. P.O. BOX 194 HUNTSVILLE, AL 35804 JEFFREY L RIGGS TITLE: MATHEMATICAL MODELING OF DISTRIBUTED COMPUTING DATA FLOW TOPIC: 8c	ARMY	\$ 49,615
OFFICE: Cndr,BMDSC		

AS COMPUTER SYSTEMS AND COMMUNICATION SYSTEMS HAVE MERGED, THE FLOW OF DATA WITHIN THESE SYSTEMS HAS BECOME INCREASINGLY IMPORTANT IN THE OVERALL ANALYSIS OF THE SYSTEMS. THIS COMPUTER/COMMUNICATION MERGER HAS SEVERAL OFFSHOOTS, NOT THE LEAST SIGNIFICANT OF WHICH IS DISTRIBUTED DATA PROCESSING. THE ANALYSIS OF THE FLOW OF DATA THROUGH THESE INTERACTING NETWORKS IS COMPLICATED, BUT ESSENTIAL TO THE DESIGN OF OPTIMALLY CONFIGURED SYSTEMS. THE ANALYSIS OF THIS FLOW USING SOPHISTICATED MATHEMATICAL TOOLS IS PROPOSED AS THE SUBJECT FOR THIS RESEARCH.

AQUIDNECK DATA CORPORATION P.O. BOX 99 MIDDLETOWN, RI 02840 RICHARD SWANSON TITLE: SOFTWARE COST ESTIMATE MODEL TOPIC: 9b	AF	\$ 49,897
OFFICE: RADC/DORP		

THE RESEARCH HEREIN PROPOSED IS INTENDED TO ADDRESS THE CONTINUING PROBLEM OF ESTIMATING SOFTWARE COSTS OVER THE LIFE OF LARGE AND COMPLEX SOFTWARE PROJETS. THE RESEARCH WILL ADDRESS ALL FACTORS THAT AFFECT SOFTWARE COSTS FROM A FUNCTIONAL STANDPOINT AS OPPOSED

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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TO THE TRADITIONAL LINES-OF-CODE (PROGRAM SIZE) APPROACH. THE FACTORS WILL BE TRANSLATED INTO A MODEL THAT EMPHASIZES THE IMPORTANCE OF INCLUDING ANALYSIS FACTORS IN LARGE SOFTWARE PROJECT COST ESTIMATION. IF MORE INFORMATION RELATING TO INTENDED SYSTEM FUNCTIONS (WITH APPLIED COST FACTORS) IS KNOWN AT PROJECT INCEPTION, SOFTWARE COSTS WILL BE MORE ACCURATE THROUGHOUT THE SOFTWARE LIFE CYCLE. ALL FACTORS AFFECTING SOFTWARE COST WILL BE ANALYZED AND THE RESULTS INCLUDED IN A REPORT THAT WILL BE THE FOUNDATION FOR A NEW SOFTWARE COST ESTIMATE MODEL.

ARTEC ASSOCIATES INCORPORATED	AF	\$ 48,769
26046 EDEN LANDING ROAD		
HAYWARD, CA 94545		
JOHN D. WATSON		
TITLE:		
FIFTY GIGAWATT PULSED PLASMA MHD POWER SUPPLY		
TOPIC: 8c	OFFICE: PRP(SBIR)	

A NEED EXISTS FOR A TRANSPORTABLE REPETITIVELY PULSED POWER SUPPLY TO PROVIDE .5MJ PULSES AT 50GW POWER LEVELS. OF SEVERAL POSSIBLE APPROACHES PULSED PLASMA MHD (PPMHD) IS A LEADING CANDIDATE FOR A COMPACT HIGH PERFORMANCE PRIME POWER SOURCE. DESIGNED TO OPERATE LIKE A RAPID-FIRE GUN, REPETITIVELY PULSED OPERATION AND SHORT HIGH POWER PULSES ARE MAJOR ATTRIBUTES. PPMHD IS BASED ON THE EFFICIENT CONVERSION OF THE ENERGY OF EXPLOSIVES TO AN ENERGETIC PLASMA AND THEN TO PULSED ELECTRICAL ENERGY IN A FARADAY MODE MHD GENERATOR. IN PROGRAMS TO DATE 10GW .25MJ PULSES HAVE BEEN DEMONSTRATED. THE SBIR PROGRAM PROVIDES THE OPPORTUNITY TO DEMONSTRATE 50 GW, .5MJ PULSES BY A CONFIGURATION OF SMALL MHD GENERATORS THAT RELY ON INHERENT SCALING PROPERTIES OF PPMHD DEVICES FOR PULSE SHAPING AND POWER CONDITIONING. THE SIZING, DESIGN CONFIGURATION AND PERFORMANCE ESTIMATE FOR A SERIES OF HIGH POWER EXPERIMENTS WILL BE ADDRESSED IN PHASE I. THIS WILL INCLUDE PERFORMANCE ANALYSES USING A UNIQUE MHD CODE WHICH ACCURATELY MODELS THE PPMHD PROCESS. EXPERIMENTAL DEMONSTRATION OF A 50 GW .5MJ GENERATOR WILL BE PROPOSED FOR PHASE II.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
ASTRON CORPORATION P.O. BOX 1047 SPRINGFIELD, VA 22151 JOSEPH R. JAHODA TITLE: BROADBAND TRANSMITTING ANTENNA TOPIC: 1d OFFICE: ERADCOM	ARMY	\$ 49,971

THERE IS A GREAT NEED FOR THE BROADBAND TRANSMITTING ANTENNA FOR COMMUNICATIONS AND JAMMING APPLICATIONS. THE MAJOR DISADVANTAGES OF PRESENT NARROW BAND ANTENNAS ARE: SLOW TUNING COUPLERS DO NOT PERMIT FREQUENCY HOPPING AND SPREAD SPECTRUM COMMUNICATIONS; SLOW TUNING COUPLERS LIMIT JAMMING SYSTEM RESPONSE TIME AND OPERATIONAL BANDWIDTHS; TO ACHIEVE REASONABLE EFFICIENCIES LARGE ANTENNA STRUCTURES ARE REQUIRED, ESPECIALLY AT THE LOWER FREQUENCIES; REQUIRE GOOD GROUND CONDUCTIVITY TO MAINTAIN REASONABLE EFFICIENCIES.

ASTRON CORPORATION HAS BEEN INVESTIGATING ADVANCED INNOVATIONS/TECHNIQUES, WHICH WHEN JUDICIOUSLY COMBINED, WILL ACHIEVE A FAMILY OF BROADBAND TRANSMITTING ANTENNAS WHICH CAN OPERATE OVER FREQUENCIES OF 1 TO 30 Mhz (WITH POTENTIAL FOR EXTENSION TO 400 mhz) AND WHICH CAN MEET THE REQUIREMENTS OF SMALL MAN-PECK, JEEP, VAN, AND AIRBORNE SYSTEMS. THE ASTRON INNOVATIONS/TECHNIQUES INCLUDE SLOW WAVE, MULTIFILAR, HIGH CURRENT, ANCILLARY ELEMENTS, MULTI-RESONANT/LENGTH AND EM PROPRIETARY STRUCTURES. EACH OF THESE TECHNIQUES WILL BE EVALUATED BY COMPUTER SIMULATION AND LABORATORY TESTS.

ASTROSPACE, INC. 2065 MARTIN AVENUE, # 103 SANTA CLARA, CA 95050 TOM DIXON TITLE: THE INTEGRATED NOZZLE ASSEMBLY (TINA) TOPIC: 3 OFFICE: AFRPL/TSPR-D	AF	\$ 54,048
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THERE WILL BE A CONTINUING NATIONAL DEFENSE NEED FOR LOW-COST SOLID OR LIQUID FUEL VEHICLES TO BE COMPLEMENTARY TO THE REUSABLE SPACE SHUTTLE SUCH EXPENDABLE VEHICLES MUST BE CREATED FROM THE EXISTING FAMILY OF ROCKET MOTORS AVAILABLE TO THE ARMED FORCES IF DEVELOPMENT COSTS

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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ARE TO REMAIN LOW. ASTROSPACE, INC. HAS DEVELOPED A ROCKET VEHICLE CONCEPT THAT COMBINES THE TRADITIONAL BENEFITS OF BUNDLING SMALL MOTORS TOGETHER WITH AN INNOVATIVE ROCKET NOZZLE TO PRODUCE A CLUSTER-BASED, VERSATILE SINGLE STAGE VEHICLE. THE KEY TECHNOLOGICAL INNOVATION THAT MAKES SUCH A VEHICLE COMPETITIVE WITH ITS MORE TRADITIONAL MULTI-STAGE COUNTERPARTS IS THE INTEGRATED NOZZLE ASSEMBLY (TINA). TINA UTILILZES ONE LARGE NOZZLE TO PRODUCE A LARGE EXPANSION RADIO FOR THE HIGH ALTITUDE BURNING MOTOR(S) AS THE SAME NOZZLE FOR THE LOW ALTITUDE BURNING MOTORS. THEREFORE, IT APPEARS THAT A TINA/CLUSTER BASED VEHICLE COULD AFFORD THE USER AN ATTRACTIVE ALTERNATIVE TO THE DEVELOPMENT OF A NEW MOTOR/VEHICLE. ASTROSPACE PROPOSES THAT A PHASE I SBIR CONTRACT BE ISSUED TO IDENTIFY THE KEY NOZZLE AND VEHICLE DESIGN ELEMENTS AND THEIR INTERACTIONS IN THIS UNIQUE CONFIGURATION, RESULTING IN A BASELINE VEHICLE TO BE THE SUBJECT OF A PHASE II RESEARCH AND DEVELOPMENT EFFORT.

ATEK CORPORATION
1789 COUNTRY CLUB DRIVE
HANOVER, NH 03755
DR. GEOFFREY E. HILL

ARMY \$ 50,000

TITLE:

AN EXPENDABLE DEVICE FOR MEASURING SUPERCOOLED LIQUID WATER
IN CLOUDS

TOPIC: 7ff

OFFICE: CORPS OF ENG

IN THE PROPOSED RESEARCH THE FEASIBILITY WILL BE ESTABLISHED FOR DEVELOPING A LOW-COST EXPENDABLE TRANSDUCER MOUNTED IN A NATIONAL WEATHER SERVICE TYPE RADIOSONDE TO MEASURE VERTICAL PROFILES OF SUPERCOOLED LIQUID WATER. THE TRANSDUCER IS BASED UPON A WIRE WHOSE NATURAL VIBRATION FREQUENCY VARIES ACCORDING TO THE AMOUNT OF ICE COLLECTED ON THE WIRE. THE RESEARCH WILL EXAMINE THE EFFECTS ON THE RESULTS OF VARIATIONS IN TEMPERATURE, AIRFLOW, DROP SIZE DISTRIBUTION AND, MOST IMPORTANTLY, OF SUPERCOOLED LIQUID WATER CONCENTRATION. TWO ALTERNATE FORMS OF THE TRANSDUCER SYSTEM WILL BE USED, ON A SMALL COIL TO SENSE THE VIBRATIONS, THE OTHER, AN OPTICAL SENSING METHOD. A SERIES OF TESTS AND CALIBRATIONS ARE PROPOSED TO DETERMINE THE VARIOUS EFFECTS BEING EXAMINED AND TO COMPARE THE SUPERCOOLED LIQUID WATER CONCENTRATIONS DERIVED FROM THE TWO TRANSDUCER FORMS AND A STANDARD METHOD OF MEASUREMENT BY A FAST ROTATING ROD. VARIOUS TYPES OF RADIOSONDE SYSTEMS WILL BE SURVEYED TO ASSESS THEIR APPROPRIATENESS FOR USE WITH THE VIBRATING WIRE.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
ATMOSPHERIC HEALTH SCIENCES, INC 152 PARSONAGE HILL ROAD, P.O. BOX 307 SHORT HILLS, NJ 07078 WILLIAM J. SPAVEN TITLE: LASER BIOSTIMULATOR FOR DENTAL ANESTHESIA TOPIC: 6p OFFICE: SGRD-MRDC	ARMY	\$ 37,088

THE PHASE I PROPOSAL IS IN RESPONSE TO THE PROGRAM SOLICITATION ON ON THE SUBJECT OF DENTAL ANESTHESIA. THE MAIN OBJECTIVE IS TO INVESTIGATE THE FEASIBILITY OF USING A PORTABLE, SELF-CONTAINED BATTERY OPERATED LASER BIOSTIMULATOR (LSB) TO ALLEVIATE DENTAL PAIN BY SEMI-SKILLED DENTAL AUXILIARY PERSONNEL ESPECIALLY IN THE BATTLEFIELD. THE PROPOSED EFFORT ENCOMPASSES THREE TASKS: 1) DESIGN, BUILD AND CHECK OUT THE ELECTRICAL AND SAFETY FEATURES ON THE LBS UNIT, 2) DEFINE OPTIMUM LASER INSTRUMENT PARAMETERS, AND 3) CONDUCT A PILOT STUDY ON HUMAN VOLUNTEERS TO ESTABLISH THE OPTIMUM LASER CONDITIONS FOR DENTAL PAIN CONTROL. BY THE END OF PHASE I IT IS ANTICIPATED THAT WE WILL HAVE "HANDS-ONS" EXPERIENCE TO IMPROVE AND MODIFY THE INVESTIGATIVE UNIT. THIS EXPERIENCE WILL HELP DESIGN FURTHER RESEARCH AND DEVELOPMENT PROGRAMS FOR PHASE II WHICH WILL ALSO ENTAIL FURTHER EXPERIMENTS ON ANIMALS AND HUMANS. SUCCESSFUL COMPLETION OF PHASE II WILL LEAD TO THE ANTICIPATED COMMERCIALIZATION OF THE LBS UNITS.

ATOM SCIENCES, INC. POB 138, 114 RIDGEWAY CENTER OAK RIDGE, TN 37830 DR. JAMES E. PARKS TITLE: DEPTH PROFILING IN AlGaAs AND LiNbO3 USING SPUTTER INITIATED RESONANCE IONIZATION SPECTROSCOPY TOPIC: 12a OFFICE: AFWAL/XRPA	AF	\$ 49 470
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WE PROPOSE THE EXTENSION OF A NEW ANALYTICAL TECHNIQUE, SPUTTER INITIATED RESONANCE IONIZATION SPECTROSCOPY (SIRIS) TO INCLUDE DEPTH PROFILING. THIS PHASE I PROJECT WILL DETERMINE THE FEASIBILITY OF MAKING THIS EXTENSION BY MAKING PRELIMINARY MEASUREMENTS USING THE

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>SIRIS TECHNIQUE ON STANDARD SAMPLES OF SI DOPED ALGAAS AND TI DOPED LINBO3. SUCH SAMPLES ARE OF INTEREST TO THE AIR FORCE'S VHSIC AND ELECTRO-OPTIC DEVELOPMENT PROGRAMS. IN SIRIS, AN ARGON ION BEAM SPUTTERS A SMALL QUANTITY OF SOLID SAMPLE INTO THE GAS PHASE. A LASER THEN SELECTIVELY (AND EFFICIENTLY) IONIZES ATOMS OF A PARTICULAR ELEMENT, USING RESONANCE IONIZATION SPECTROSCOPY (RIS). RESULTING IONS ARE ANALYZED IN A MAGNETIC MASS SPECTROMETER, THUS ADDING ISO-TOPIC SELECTIVITY TO THE ELEMENTAL SELECTIVITY PROVIDED BY RIS. IN PHASE I OF THE PROPOSED PROJECT, WE WOULD DEMONSTRATE THE SENSITIVITY OF SIRIS TO DETECT SI AND TI AND WOULD DETERMINE THE DEPTH RESOLUTION THAT COULD BE ACHIEVED BY INCORPORATING DEPTH PROFILING CAPABILITY INTO THE TECHNIQUE.</p>		

AXXON VOICE PRODUCTS 720 S. CAMINO GRANDE ANAHEIM, CA 92807 BRUCE POETSCH TITLE: VOICE CONTROLLED DISPLAY TOPIC: 9L	ARMY	\$ 49,000
OFFICE: ERADCOM		

VOICE RECOGNITION AND VOICE SYNTHESIS WORK WELL BUT NOT WELL ENOUGH VOICE SYNTHESIS IS TOO ARTIFICIAL SOUNDING AND VOICE RECOGNITION ONLY WORKS IN IDEAL CONDITIONS. THE ERRORS THAT OCCUR IN A NORMAL ENVIRONMENT INDICATE TO THE USER THAT VOICE TECHNOLOGY IS NOT READY, WHEN IN FACT IT SIMPLY LACKS ADEQUATE SOFTWARE INTELLIGENCE TO PREVENT MISTAKES. THE PURPOSE OF THIS RESEARCH IS TO ENHANCE WITH ARTIFICIAL INTELLIGENCE SOFTWARE, THE BASIC CAPABILITIES OF THE CURRENT HARDWARE. THIS ARTIFICIAL INTELLIGENCE PARALLELS THE WAY HUMANS USE EXPERIENCE AND CONTEXT TO HELP THEM UNDERSTAND NORMAL CONVERSATION. VOICE RECOGNITION WILL BE USED TO SIMULATE THE KEYBOARD IN THE CONTROL OF DISPLAYS.

B-K DYNAMICS, INC. 3204 MONROE STREET, BOX 6012 ROCKVILLE, MD 20850 PATRICK P. MCDERMOTT TITLE: TECHNOLOGY ASSESSMENT/EVALUATION METHODOLOGY TOPIC: 97	NAVY	\$ 48,892
OFFICE: NASC		

THE NAVAL AIR SYSTEMS COMMAND (NAVAIR) NEEDS A METHODOLOGY TO PROVIDE A MEANS OF IDENTIFYING, EVALUATING, AND PRIORITIZING THOSE TECHNOLOGIES WHICH BEST MEET FUTURE NAVY OPERATIONAL NEEDS IN AREAS OF NAVAIR INTEREST. TO THIS END, BKD PROPOSES TO: (1) DEVELOP

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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<p>CHARACTERISTICS AND EVALUATION CRITERIA FOR A METHODOLOGY WHICH WILL ACCOMPLISH THIS GOAL; (2) DEVELOP DESCRIPTIONS OF EXISTING RELEVANT METHODOLOGIES; (3) DEVELOP A BRIEFING BOOK IN WHICH THOSE METHODOLOGIES ARE DESCRIBED AND THEIR STRENGTHS AND WEAKNESSES IDENTIFIED; (4) THROUGH STRUCTURED BRIEFINGS AND INTERVIEWS WITH NAVAIR PERSONNEL DESIGNATED BY THE CONTRACT TECHNICAL MONITOR, SOLICIT THEIR OPINIONS REGARDING THE CHARACTERISTICS/CRITERIA DEVELOPED, THE RELATIVE VALUE OF THE METHODOLOGIES, WHICH ASPECTS OF EACH SHOULD BE INCLUDED IN THE FINAL METHODOLOGY, AND ANY OTHER RECOMMENDATIONS; (5) BASED ON THE ABOVE, PREPARE AN OPTIMUM METHODOLOGY TO ACHIEVE NAVAIR'S GOALS; AND, FINALLY, (6) VALIDATE THE METHODOLOGY DEVELOPED IN THIS PROCESS BY APPLYING IT TO SELECTED TECHNOLOGIES APPLICABLE TO A SPECIFIC SEGMENT OF NAVAIR'S OVERALL PROGRAM.</p>		

BAND, LAVIS & ASSOCIATES, INC. 670 RITCHIE HIGHWAY SEVERNA PARK, MD 21146 EDWARD G.U. BAND TITLE: EXTREME SEAWAY LOADS CHARACTERIZATION FOR SHIP STRUCTURE TOPIC: 49	NAVY	\$ 34,618
OFFICE: NSSC		

SHIPS HAVE LONG BEEN DESIGNED TO EMPIRICAL FORMULAE THAT DO NOT REPRESENT REALISTIC CONDITIONS FOR MODERN NAVAL VESSELS IN EXTREME SEA CONDITIONS. AS A CONSEQUENCE, SHIPS FREQUENTLY SUFFER EXPENSIVE DAMAGE IN HEAVY SEAS. THE OBJECTIVE OF THE PROPOSED RESEARCH IS TO ATTEMPT TO IDENTIFY SPECIFIC EXAMPLES OF EXTREME WAVES OF THE TYPE THAT HAVE BEEN KNOWN TO CAUSE SPECIFIC TYPES OF DAMAGE. AS FAR AS POSSIBLE, THE DAMAGE EXPERIENCED BY SHIPS WILL BE CATEGORIZED AND RELATED TO EXTREME WAVE CONDITIONS. THE LOADS REQUIRED TO CAUSE THE DAMAGE WILL BE ESTIMATED SO THAT A DATA BASE OF REAL WAVES AND REAL WAVE LOADS CAN BE DEVELOPED THAT CAN BE USED IN FUTURE SHIP DESIGN. IN THIS WAY, IT IS ANTICIPATED THAT UNSUITABLE STRUCTURAL ARRANGEMENTS CAN BE AVOIDED AND THAT STRUCTURES CAN BE DESIGNED TO WITHSTAND THE LOADS THAT HAVE BEEN KNOWN TO OCCUR. THIS WILL RESULT IN IMPROVED SAFETY DURING SEVERE STORMS AND IN IMPROVED COMBAT READINESS AFTER SUCH STORMS.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
BATTERY ENGINEERING, INC. 1636 HYDE PARK AVENUE HYDE PARK, MA 02136 JAMES EPSTEIN TITLE: SAFETY IMPROVEMENTS TO LITHIUM RESERVE BATTERIES TOPIC: 25 OFFICE: NSSC	NAVY	\$ 49,984

A NOVEL APPROACH TO THE SAFETY OF RESERVE BATTERIES IS TAKEN, BASED ON A BATTERY DESIGN THAT ELIMINATES THE USE OF A SEPARATE RESERVOIR TO STORE THE ELECTROLYTE DURING INACTIVE LIFE OF THE BATTERY. CELLS WITHOUT THE ELECTROLYTE AND THE ELECTROLYTE ITSELF ARE SITUATED IN A BATTERY CONTAINER, STORED UNDER VACUUM. THE BATTERY IS ACTIVATED SIMPLY BY ADMITTING THE AIR INTO THE CONTAINER. THE AIR FORCES THE ELECTROLYTE INTO EACH CELL IN A BATTERY, CONNECTED IN SERIES OR IN PARALLEL. THE SAFETY FEATURE INCORPORATED IN THIS DESIGN IS BASED ON THE FACT THE THE CELLS UPON ACTIVATION REMAIN OPEN TO THE BATTERY CONTAINER, WHICH IS HERMETICALLY ISOLATED FROM THE ENVIRONMENT. THE ELECTROLYTE FILL TUBES SERVE AS VENTS, SO THAT ANY CELL UNDER ABUSE COULD DISCHARGE ITS ELECTROLYTE BACK INTO THE BATTERY CONTAINER AND AVOID THE INTERNAL PRESSURE BUILD-UP THAT SOMETIMES LEADS TO EXPLOSION. THE PHASE ONE OF THE PROGRAM WOULD BE DEDICATED TO THE STUDY OF SAFETY ASPECTS OF THIS NEW RESERVE BATTERY DESIGN.

BELTRAN ASSOCIATES, INC. 200 OAK DRIVE SYOSSET, NY 11791 MICHAEL R. BELTRAN TITLE: SOLID FUEL RAMJET - FUELS AND COMBUSTORS TOPIC: 13 OFFICE: AFWAL/ERP-PO	AF	\$ 50,000
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THE SOLID FUEL RAMJET (SFRJ) IS CURRENTLY BEING CONSIDERED AS A PROPULSION DEVICE FOR A NUMBER OF AIR FORCE TACTICAL APPLICATIONS. THE PROPOSED PHASE I WORK WILL BE AN EXPLORATORY DEVELOPMENT EFFORT IN THE FOLLOWING AREAS, TO EVALUATE WHICH OF THE CONCEPTS ARE WORTHY

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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OF FURTHER DEVELOPMENT UNDER PHASE II, CONSIDERING THE REQUIREMENTS OF THE AIR FORCE MISSION FOR THE SOLID FUEL RAMJET: (A) ALTERNATE FUELS WILL BE EVALUATED WHICH HAVE ATTRACTIVE POTENTIAL PERFORMANCE CHARACTERISTICS FOR BOTH VOLUME-LIMITED AND WEIGHT LIMITED APPLICATIONS. THE PROPOSED RESEARCH WILL EVALUATE THE PRACTICABILITY OF EFFICIENT COMBUSTION OF THESE FUELS; (B) BOTH ANALYTICAL AND EXPERIMENTAL METHODS WILL BE EVALUATED FOR ADDITIONAL COMBUSTION CHARACTERIZATION OF GRAIN REGRESSION RATE VERSUS PRESSURE, ETC. FOR EXISTING SOLID FUELS AND GRAIN DESIGNS; (C) VARIOUS INNOVATIVE IDEAS WILL BE EVALUATED TO DETERMINE PRACTICAL METHODS OF FUEL FLOW CONTROL DURING COMBUSTION, AND/OR PRACTICAL METHODS OF VEHICLE SPEED CONTROL, TO PERMIT OPTIMUM PERFORMANCE.

BEND RESEARCH, INC.
64550 RESEARCH ROAD
BEND, OR 97701
WALTER C. BABCOCK

ARMY \$ 47,958

TITLE:

CHLORINE-RESISTANT HOLLOW-FIBER REVERSE-OSMOSIS MEMBRANE ELEMENTS
TOPIC: 7e OFFICE: MERDC

COMMERCIALLY AVAILABLE REVERSE-OSMOSIS MEMBRANES ARE CHEMICALLY ATTACHED BY CHLORINE. THUS, CHLORINATION CANNOT BE USED TO PREVENT BIOLOGICAL FOULING OF THE MEMBRANE ELEMENTS. WE PROPOSE DEVELOPMENT OF CHLORINE-RESISTANT MEMBRANE ELEMENTS FOR BRACKISH WATER AND SEAWATER DESALINATION. THE MEMBRANES WILL CONSIST OF A THIN POLYAMIDE SALT REJECTING BARRIER ON THE INSIDE SURFACE OF POLYSULFONE HOLLOW FIBERS. THESE COMPOSITE HOLLOW FIBERS ARE USED IN TUBE SIDE FEED HOLLOW FIBER MEMBRANE ELEMENTS. SUCH ELEMENTS ARE MORE FOULING RESISTANT THAN THOSE CURRENTLY AVAILABLE, REDUCING PRETREATMENT REQUIREMENTS. ADDITIONALLY, THEY ARE RELATIVELY LIGHT-WEIGHT FOR THE REASON THAT THEY REQUIRE NO PRESSURE VESSEL. THEY ARE THUS HIGHLY SUITED TO MOBILE WATER PURIFICATION UNITS. IN PHASE I WE WILL PREPARE COMPOSITE HOLLOW-FIBER MEMBRANES, MEMBRANE ELEMENTS WILL BE CONSTRUCTED AND EVALUATED FOR THEIR WATER FLUX, SALT REJECTION, AND RESISTANCE TO FEED WATER CONTAINING CHLORINE. OUR TARGET IS TO OBTAIN SMALL MEMBRANE ELEMENTS THAT CAN WITHSTAND 20000 PPM-

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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HR OF CHLORINE EXPOSURE.

BILL C. GIALLOURAKIS, A PROF CORP. 90 MONMOUTH STREET RED BANK, NJ 07701 BILL C. GIALLOURAKIS TITLE: COST ANALYSIS SOFTWARE FOR CONTRACT ADMINISTRATION (CASCA) TOPIC: 19b OFFICE: ASD/YZD	AF	\$ 42,782
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THIS PROJECT IN PHASE I, EXAMINES THE TECHNICAL FEASIBILITY OF AUTOMATING THE USE OF THE UNDERLYING LEARNING CURVE (ULC) APPROACH FOR USE BY CONTACT ADMINISTRATION ORGANIZATIONS. THE UNDERLYING LEARNING CURVE (ULC) TECHNIQUE COMBINES BOTH ENGINEERING AND PARAMETRIC ESTIMATING APPROACHES TO PROVIDE A "SHOULD COST" ESTIMATE OF DIRECT LABOR. ULC ALLOWS THE DISCIPLINED INTEGRATION OF THE DATA FOUND IN THE CONTRACTORS'S WORK MEASUREMENT AND COST ACCOUNTING SYSTEMS, LEADING TO THE QUANTIFICATION OF THE TIME ASSOCIATED WITH PARKINSON'S LAW. PROJECT INCLUDES REVIEW OF LATEST LEARNING CURVE LITERATURE, UNDERLYING LEARNING CURVE THEORIES, DEVELOPMENT OF AUTOMATED DATA SYSTEMS DOCUMENTATION, AND PILOT COMPUTER SOFTWARE, TEST EVALUATION OF THE ULC APPROACH. FINAL REPORT INCLUDES DOCUMENTATION IN ACCORDANCE WITH DODI 7935.1-S, AUTOMATED DATA SYSTEMS DOCUMENTATION STANDARDS.

BIOCHEM INTERNATIONAL, INC. P.O. BOX 13157 MILWAUKEE, WI 53213 LAI, N.C. JOSEPH TITLE: FIELD LABORATORY FOR BLOOD GASES, pH, AND K+ TOPIC: 6z OFFICE: SGRD	ARMY	\$ 52,135
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INTRODUCTION: PRESENT BLOOD GAS AND ELECTROLYTE INSTRUMENTATION IS DESIGNED PRIMARILY FOR HOSPITAL USE. A FIELD UNIT MUST BE PORTABLE, TECHNICALLY EASY TO OPERATE, AND BE OPERATIONAL ALMOST IMMEDIATELY AFTER BEING TAKEN FROM STORAGE OR HAVING BEEN TRANSPORTED.

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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PROJECTED OBJECTIVE: THE PURPOSE OF THIS PROPOSAL IS TO DEVELOP A PROTOTYPE FIELD LABORATORY FOR MEASUREMENT OF BLOOD PO₂, PCO₂, pH, HCO₃, K⁺

METHODS: THE FIELD LABORATORY WILL BE DEVELOPED USING SENSOR TECHNOLOGY WHICH BIOCHEM IS PRESENTLY USING IN THEIR COMMERCIAL PRODUCTS; A NON-GLASS POLYMERIC pH AND DUAL FUNCTION pH/PCO₂ SENSOR FOR INTRAVASCULAR MEASUREMENT (USING BIOCHEM'S EXCLUSIVE H⁺ SELECTIVE MEMBRANE TECHNOLOGY), A MUSCLE TISSUE pH SENSOR, TRANSCUTANEOUS PO₂ AND PCO₂ SENSORS AND AN ION SELECTIVE K⁺ MEMBRANE INTRAVASCULAR AND MUSCLE-TISSUE SENSOR. METHODS OF CALIBRATION AND CLEANING OF THE ELECTRODES WHICH ARE MOST APPROPRIATE FOR A FIELD UNIT WILL BE ESTABLISHED. AFTER THE ELECTRODE SYSTEM HAS BEEN DEVELOPED, THE ELECTRONICS PACKAGE WILL BE REDESIGNED FOR FIELD USE.

BURKE-GILBERT ENGINEERS
3642 FANWOOD AVENUE
LONG, BEACH, CA 90808
ANNIE LAURIE BURKE

ARMY \$ 49,845

TITLE:

DEVELOPMENT OF AN ARTIFICIALLY INTELLIGENT EXPERT SYSTEM FOR
DIAGNOSING ENERGY INEFFICIENCIES IN BUILDINGS

TOPIC: 9t OFFICE: CORP OF ENG

THE OVERALL OBJECTIVE OF THE PROPOSED WORK TO ASSIST IN ENERGY CONSERVATION ON A NATIONAL SCALE, BY PROVIDING A DIAGNOSTIC TOOL FOR DETERMINING ENERGY INEFFICIENCY IN BUILDINGS. DIAGNOSTIC EXPERTISE TO FACILITATE THIS TASK MUST BE MADE AVAILABLE WIDELY ON A LOW COST PER SITE BASIS. HOWEVER, THIS EXPERTISE MUST BE DEPLOYED IN A TIMELY FASHION, PRECLUDING AN ACADEMIC TRAINING APPROACH. SIGNIFICANT ENERGY SAVINGS CAN BE MADE IN THE NATIONAL AGGREGATE, IF RELATIVELY SIMPLE, LOW COST MEASURES ARE WIDELY APPLIED. WE PROPOSE THAT THE EMERGING TECHNOLOGY OF ARTIFICIALLY INTELLIGENT EXPERT SYSTEMS IS APPROPRIATE FOR THIS PURPOSE. EXPERTISE, IN THE FORM OF COMPUTER SOFTWARE, CAN BE REPATRIATED AND DISTRIBUTED CHEAPLY AND RAPIDLY. THE APPROACH TO BE TAKEN IN PHASE I HAS TO DEMONSTRATE THE FEASIBILITY AND COST EFFECTIVENESS OF THE PROTOTYPE EXPERT SYSTEM AS A POWERFUL AND FLEXIBLE DIAGNOSTIC TOOL, CAPABLE OF SERVING THE NEEDS OF ENERGY MANAGERS. PRINCIPAL TASKS IN PHASE I ARE: TECHNICAL TASKS (DEVELOPING OF PARTIAL KNOWLEDGE-BASE AND RULE-SET FOR THIS APPLICATION);

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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AND STUDIES OF THE PRACTICABILITY OF THE APPLICATION (MARGINAL COSTS OF DEPLOYING THE SYSTEM, ANTICIPATED PAYOFFS FROM ITS USE, AND RECOMMENDATIONS FOR FURTHER DEVELOPMENT). IN PHASE II, AN OPERATIONAL PROTOTYPE EXPERT SYSTEM WILL BE TESTED.

CAMTECH, INC.	AF	\$ 37,591
14811 SE 172ND PLACE		
RENTON, WA 98055		
RICHARD A. MATHIAS		
TITLE:		
AN ADVANCED MACHINE TOOL SPINDLE FORCE AND TORQUE SENSOR USING MIH-CELL TECHNOLOGY		
TOPIC: 11i	OFFICE: AFWAL/XRPM	

TO ACHIEVE ADAPTIVE CONTROL, FAULT DIAGNOSTICS, SAMPLED DATA OF MACHINE PERFORMANCE AND TOOL WEAR, MODERN MACHINE TOOLS REQUIRE RELIABLE SENSING OF ONE OR MORE OF SIX FORCE COMPONENTS (X, Y, Z, TORQUE, A&B MOMENTS) ACTING ON THE TOOL. PRESENT FORCE SENSING METHODS EITHER HAVE INSUFFICIENT RESOLUTION AND TIME RESPONSE, ARE COSTLY TO INSTALL, CALIBRATE AND REPLACE, LACK A RELIABLE, LOW COST AND EASY TO INSTALL SIGNAL TRANSMISSION METHOD FOR ROTARY SPINDLES OR RESULT IN SIGNIFICANT COMPLIANCE (DEFLECTION) OF TOOL OR WORK PIECE SUPPORT. A REVOLUTIONARY METHOD OF ACCURATELY SENSING SMALL FORCES (+ 5 LBS) APPLIED TO RIGID MACHINE MEMBERS (SUCH AS SPINDLES AND TOOL BLOCKS) HAS BEEN DISCOVERED BY CAMTECH. IT INVOLVES ATTACHING OR IMPLANTING A UNIT CALLED A MIH-CELL MODULE ONTO OR INTO THE SPINDLE NOSE OR TOOL BLOCK BASE. FOR SPINDLES AND OTHER REMOTE SIGNAL TRANSMISSION REQUIREMENTS THE MODULE MUST ALSO CONTAIN WIRELESS DATA TRANSMISSION ELECTRONICS. THE OBJECTIVES OF PHASE I ARE TO (1) ESTABLISH THROUGH ANALYSIS A GENERAL APPROACH FOR DESIGNING MIH-CELLS FOR MODULAR ATTACHMENT ONTO OR INTO SPINDLE NOSES AND TOOLS BLOCKS (2) DESIGN A SPINDLE-MOUNTED PROTOTYPE MIH-CELL MODULE TO BE INSTALLED AND PERFORMANCE EVALUATED IN PHASE II (3) DESIGN PROTOTYPE WIRELESS INPUT POWER AND OUTPUT SIGNAL TRANSMISSION ELECTRONICS FOR RELIABLE OPERATION WITHIN THE MODULE AT HIGH RPM, (4) DEVELOP PERFORMANCE EVALUATION TEST OBJECTIVES AND PROCEDURES.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
CAMTECH, INC. 14811 SE 172ND PLACE RENTON, WA 98055 RICHARD A. MATHIAS TITLE: THE DEVELOPMENT OF MIH-CELL TECHNOLOGY FOR PRECISION THRUST MEASUREMENT IN GROUND TESTING ROCKET AND TURBINE ENGINES TOPIC: 16a OFFICE: AEDC/DOT	AF	\$ 31,449

PRESENT THRUST SENSING METHODS ON ROCKET ENGINE GROUND TEST STANDS EITHER HAVE INSUFFICIENT RESOLUTION AND TIME RESPONSE, ARE COSTLY TO INSTALL, CALIBRATE AND REPLACE OR RESULT IN/REQUIRE SIGNIFICANT ADDED STRUCTURAL COMPLIANCE. A REVOLUTIONARY METHOD OF ACCURATELY SENSING SMALL FORCES APPLIED TO RIGID MEMBERS HAS BEEN DISCOVERED BY CAMTECH. IT INVOLVES ATTACHING OR IMPLANTING A UNIT CALLED A MIH-CELL MODULE INTO OR ONTO THE STRUCTURAL MEMBER. IN ADDITION TO BEING DESIGNED FOR HIGH SENSITIVITY, THE MIH-CELL IS ALSO DESIGNED FOR ZERO THERMAL DRIFT. THE OBJECTIVES OF PHASE I ARE TO (1) ESTABLISH THROUGH ANALYSIS MINIMUM TEST STAND STRUCTURAL STIFFNESS REQUIREMENTS FOR RELIABLE STATIC AND DYNAMIC MEASUREMENTS OVER A 30,000 POUND RANGE USING THE SENSOR (2) DEVELOP A GENERAL APPROACH FOR DESIGNING MIH-CELLS FOR MODULAR ATTACHMENT ONTO OR INTO THE ENGINE MOUNT STRUCTURE OF A ROCKET ENGINE TEST STAND, (3) DESIGN A MIH-CELL BASED THRUST SENSOR AND RECOMMEND STRUCTURAL IMPROVEMENTS FOR A DESIGNATED ROCKET ENGINE TEST STAND (4) DEVELOP A TEST PROCEDURE FOR EVALUATING THE SENSORS PERFORMANCE WHEN MOUNTED TO A STRUCTURE SIMILAR TO THAT OF THE DESIGNATED TEST STAND (5) DEVELOP INSTALLATION AND CHECKOUT PROCEDURES FOR MOUNTING THE MIH-CELL MODULE ON THE DESIGNATED ROCKET ENGINE TEST STAND AND TRANSMITTING THE SENSOR SIGNALS TO A RECEIVING AND MONITORING STATION.

CAPE COD RESEARCH, INC. P.O. BOX 600 BUZZARDS BAY, MA 02532 DR. MYLES WALSH TITLE: SEA WATER ROPE BATTERIES TOPIC: 1a OFFICE: DARPA	DARPA	\$ 49,999
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THE PURPOSE OF THE PROPOSED RESEARCH EFFORT IS TO INVESTIGATE THE FEASIBILITY OF SUPPLYING APPROXIMATELY 1 WATT OF ELECTRICAL POWER FOR ONE YEAR ON THE SEA BED WITH A NOVEL BATTERY, THE ROPE BATTERY. THE PROPOSED BATTERY WOULD LOOK VERY MUCH LIKE SMALL DIAMETER WIRE ROPE,

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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POSSIBLY HUNDREDS OF FEET LONG. THIS UNUSAL SHAPE PERMITS THE ROPE BATTERY TO TAKE FULL ADVANTAGED OF THE VASTNESS OF THE OCEAN FLOOR AND PERMITS AT GREAT PRESSURE, THE STEADY DIFFUSION OF REACTION PRODUCTS AWAY FROM THE BATTERY ITSELF.

THE RESEARCH FOCUSES ON DEVELOPING A SEA WATER BATTERY CONSISTING OF AN INNER BUNDLE OF COATED WIRES WHICH SLOWLY CORRODE AND AN OUTER-LAYER OF WIRES WHICH SIMULTANEOUSLY PROVIDES STRENGTH, ARMOR AND SURFACE ARE FOR SLOW HYDROGEN EVOLUTION.

CAS, INC.	AF	\$ 48,179
555 SPARKMAN DRIVE, SUITE 1022		
HUNTSVILLE, AL 35805		
JOHN R. ROBBINS		
TITLE:		
THREAT DEFINITION AND TECHNOLOGY ASSESSMENT FOR A SPREAD SPECTRUM		
RECEIVER FOR ARH MISSILES		
TOPIC: 17a	OFFICE: AD/CZO	

THE PRIMARY OBJECTIVE OF THIS PROJECT IS TO PROVIDE THE DESIGNER OF AN TI-RADIATION HOMING MISSILES WITH THE INFORMATION NECESSARY TO STRUCTURE FUTURE STUDIES AND TECHNOLOGY PROGRAMS AIMED AT DEVELOPING AN ANTI-RADIATION MISSILE CAPABLE OF HOMING ON THREAT RADARS UTILIZING SPREAD SPECTRUM TECHNIQUES. THIS INVOLVES THE FOLLOWING TWO TASKS:

1. DEFINE THE CHARACTERISTICS OF THE THREAT RADARS THAT DRIVE THE DESIGN OF AN APPROPRIATE MISSILE RECEIVER.
2. EXAMINE CURRENT AND FUTURE TECHNOLOGY APPLICABLE TO THE DEVELOPMENT OF SPREAD SPECTRUM RECEIVERS FOR MISSILE USE.

CAS, INCORPORATED	ARMY	\$ 49,615
555 SPARKMAN DRIVE, SUITE 1022		
HUNTSVILLE, AL 35805		
JACK BRADFORD		
TITLE:		
DISTRIBUTED COMPUTING DEVELOPMENT		
TOPIC: 8c	OFFICE: BMDSC	

THE OBJECTIVE OF THIS EFFORT IS TO ESTABLISH PAYOFF MEASUREMENT PARAMETERS AND ATTENDANT WEIGHTING VALUES/RANGES FOR DISTRIBUTED DATA PROCESSING SYSTEMS FOR VARIOUS BALLISTIC MISSILE DEFENSE (BMD) SYSTEM ARCHITECTURES. THESE PARAMETERS AND WEIGHTING SCHEMES WILL BE

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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ESTABLISHED TO ACHIEVE OPERATIONAL EFFECTIVENESS, AS WELL AS THE DEFINITION, DESIGN, AND CONSTRUCTION PROCESSES AND METHODOLOGIES DEVELOPED AND CONTINUALLY IMPROVED BY THE ADVANCED TECHNOLOGY CENTER (ATC) FOR DATA AND SOFTWARE PROCESS(ES) DEVELOPMENT.

CERAMATEC, INC. 163 WEST 1700 SOUTH SALT LAKE CITY, UT 84115 JAMES R. RASMUSSEN TITLE: HIGH ENERGY HIGH POWER DENSITY SODIUM/MIXED CHALCOGENIDE BATTERIES FOR SPACE POWER APPLICATIONS. TOPIC: 13a	AF	\$ 70,000
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OFFICE: AFWAL/XRP-PO

WORK IS PROPOSED TO ASSESS THE FEASIBILITY OF SODIUM/SULFUR-SELENIUM BATTERIES FOR ELECTRICALLY POWERED ADVANCED WEAPONS SYSTEMS ABOARD AIR BREATHING AIRCRAFT AND FOR ENERGY STORAGE ABOARD ORBITAL FLIGHT VEHICLES. SEVERAL POTENTIAL ADVANTAGES OF THE SODIUM/SULFUR-SELENIUM BATTERY OVER THE SODIUM-SULFUR BATTERY ARE POINTED OUT, INCLUDING HIGHER POWER AND ENERGY DENSITIES AND LONGER LIFETIMES. BASED ON SOME PRELIMINARY EXPERIMENTS WHICH WE HAVE PERFORMED, A PLAN OF WORK IS PRESENTED WHICH INCLUDES: 1) EVALUATION OF THE SODIUM-SULFUR-SELENIUM PHASE DIAGRAM, 2) DESIGN AND FABRICATION OF TWO OPERATING CELLS, AND 3) CYCLIC TESTING OF THE CELLS TO EVALUATE OPERATING CHARACTERISTICS.

CHARLES EVANS & ASSOCIATES 1670 SOUTH AMPHLETT BLVD. SUITE 120 SAN MATEO, CA 94402 DAVID REED/JOHN C. HUNEKE TITLE: EVALUATION AND DEVELOPMENT OF MODULATED REFLECTANCE INSTRUMENTATION FOR THE RAPIDMICROSCOPIC CHARACTERIZATION OF COMPOUND SEMICONDUCT TOPIC: 7	DARPA	\$ 49,727
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OFFICE: DARPA

COMPOUND SEMICONDUCTORS SUCH AS GaAs AND InP BASED III-V ALLOYS AND II-VI ALLOYS SUCH AS CdTe AND HgCdTe WILL HAVE WIDESPREAD USE IN DEFENSE-RELATED ELECTRONICS SYSTEMS. A VARIETY OF TECHNIQUES EXIST FOR THE MICROANALYSIS OF CHEMICAL CONSTITUENTS CONTAINED IN THESE

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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MATERIALS. THE PROPOSED RESEARCH WILL EVALUATE AND DEVELOP AN APPROACH FOR THE RAPID, HIGH SPATIAL RESOLUTION CHARACTERIZATION OF COMPOUND SEMICONDUCTOR ALLOY COMPOSITION AND UNIFORMITY BASED ON PHYSICAL AND ELECTRICAL RATHER THAN CHEMICAL PROPERTIES. THE TECHNIQUE TO BE EVALUATED IS MODULATED REFLECTANCE SPECTROSCOPY (MRS), WHEREIN THE MEASUREMENT OF OPTICAL FEATURES IN THE REGION OF PHOTON ENERGIES FROM 1 TO 6eV PROVIDES INFORMATION ON THE TOPOGRAPHIC VARIATIONS IN COMPOSITION (CARRIER CONCENTRATION) AND STRAINS AT HETEROJUNCTION INTERFACES, PROPERTIES OF SPACE CHARGE REGIONS, ION IMPLANTATION DAMAGE, ETC. THE GOAL IS TO DEVELOP CONCEPTS NECESSARY FOR MICROSCALE MRS EMPLOYING LATERAL IMAGING OR LOCALIZATION TO 1-50 um AND SPUTTER-ION ETCHING TO PROVIDE IN-DEPTH PROFILING OF THE COMPOSITIONAL VARIATIONS. IF A VIABLE INSTRUMENTAL CONCEPT IS ISOLATED, A PROTOTYPE SYSTEM WILL BE BUILT IN PHASE II AND INSTRUMENTAL AND OPERATING CAPABILITIES DEVELOPED. PHASE III WOULD CARRY THIS INSTRUMENT INTO THE MARKETPLACE AND MAKE IT AVAILABLE TO A WIDE VARIETY OF RESEARCH, DEVELOPMENT AND MATERIALS PROCESSING LABORATORIES.

CODON
430 VALLEY DRIVE
BRISBANE, CA 94005
JAMES FILES, PH.D.

ARMY \$ 49,750

TITLE:
RAPID DIAGNOSIS OF LEISHMANIA
SPECIES USING SPECIFIC DNA HYBRIDIZATION
TOPIC: 6a OFFICE: SGRDMRDC

LEISHMANIASIS, ONE OF THE MOST WIDESPREAD AND DEBILITATING PROTOZOAL DISEASES OF MAN, IS PREVALENT IN SOUTH AND CENTRAL AMERICA AND THE MIDDLE EAST. THE SEVERITY OF THE DISEASE, EXTENT OF DRUG THERAPY, AND THE REQUIRED AMOUNT OF FOLLOW-UP HEALTH CARE IS SPECIES DEPENDENT. CURRENT DIAGNOSTIC METHODS FOR IDENTIFYING THE DOZEN OR SO SPECIES OF LEISHMANIA IN CUTANEOUS LESIONS OR ASPIRATES ARE LABORIOUS AND TIME CONSUMING. THE OBJECTIVE OF THIS PROPOSAL IS TO PRODUCE BIOTIN-LABELLED DNA PROBES THAT DIFFERENTIATE BETWEEN L. DONOVANI AND L. TROPICA IN ANNEALING REACTIONS. THESE PROBES CAN BE USED TO DETERMINE THE SPECIES OF AMASTIGOTES PRESENT IN CUTANEOUS LESIONS, AND THEREBY INDICATE THE PROBABILITY OF A SIMPLE CUTANEOUS INFECTION L. TROPICA VERSUS A POSSIBLE FATAL INVOLVEMENT OF THE VISCERA L. DONOVANI. AFTER

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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PHASE I IS COMPLETED PHASE II WILL INCLUDE FURTHER TESTING OF THE PROBES AGAINST ADDITIONAL ISOLATES OF LEISHMANIA AND PREPARING NEW PROBES FOR SEVERAL OTHER LEISHMANIA SPECIES.

COMPUTATIONAL MECHANICS CONSULTANTS, INC 3601A CHAPMAN HIGHWAY KNOXVILLE, TN 37920 R. L. ANDREWS TITLE: ARTIFICIAL INTELLIGENCE/ROBOTIC SUPPLEMENT TO MEDICAL SUPPORT TOPIC: 5L	ARMY	\$ 49,708
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OFFICE: SGRD-MRDC

THE CURRENT STATE OF ROBOTIC TECHNOLOGY IS FAR FROM THE GOAL OF AUTOMATED INTELLIGENT BEINGS. IN THE INDUSTRIAL SCENERIO WHERE MUCH OF THE CURRENT ROBOT DEVELOPMENT HAS BEEN APPLIED, MOST ROBOTS ARE LITTLE MORE THAN ADVANCED NUMERICAL MACHINES. LIMITED FEEDBACK SENSING AND CONTROL HAVE BEEN IDENTIFIED AS A MAJOR LIMITATION OF CURRENT ROBOT TECHNOLOGY. AUTOMATED OR SEMI-AUTOMATED CASUALTY ASSISTANCE AND RETRIEVAL ON THE BATTLEFIELD WILL REQUIRE SYSTEMS HAVING ARTIFICIAL INTELLIGENCE WHICH CAN MEASURE AND REACT TO A NUMBER OF STIMULI OF VARYING MAGNITUDE. ONE APPROACH IS TO SUBDIVIDE THE PROBLEM INTO TWO SYSTEMS. THE FIRST SYSTEM IS A BATTLEFIELD RANGING DEVICE USED TO LOCATE, IDENTIFY AND TRANSMIT TO HUMAN BODIES. THE SECOND SYSTEM OPERATES AT CLOSE RANGE USING A NUMBER OF VITAL SIGN SENSORS TO DIAGNOSE AND TAKE CORRECTIVE ACTION. THIS PROPOSAL DESCRIBES A PROJECT TO RESEARCH A SYSTEM OF THE SECOND TYPE. A NOVEL SOFT END-EFFECTOR SYSTEM (SEES) IS PROPOSED WHICH OPERATES FROM A JOINTED MANIPULATOR ARM AND CONTAINS AN EXTREMELY CLOSE PROXIMITY AND UPON CONTACT, ARMS, HEAD, ETC. ARE PERCEIVED AND PULSE, TEMPERATURE AND OTHER VITAL SIGNS MONITORED. PREDETERMINED (PROGRAMMED) CORRECTIVE ACTIONS CAN BE MADE WITHIN THE PHYSICAL CAPABILITY OF A DEVELOPED SYSTEM.

COMPUTATIONAL MECHANICS CONSULTANTS, INC 3601A CHAPMAN HIGHWAY KNOXVILLE, TN 37920 R.L. ANDREWS TITLE: AUTOMATED AMMUNITION LOADING OF COMBAT VEHICLE TOPIC: 5d	ARMY	\$ 49,708
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OFFICE: CDR,HEL

THE CURRENT STATE OF ROBOTOC TECHNOLOGY IS FAR FROM THE GOAL OF AUTOMATED INTELLIGENT BEING. IN THE INDUSTRIAL SCENERIO WHERE MUCH OF THE CURRENT ROBOT DEVELOPMENT HAS BEEN APPLIED, MOST ROBOTS ARE LITTLE MORE THAN ADVANCED NUMERICAL MACHINES. LIMITED FEEDBACK SENSING AND

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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CONTROL HAVE BEEN IDENTIFIED AS A MAJOR LIMITATION OF CURRENT ROBOT TECHNOLOGY. AUTOMATED OR SEMI-AUTOMATED AMMUNITION LOADING OF COMBAT VEHICLES REQUIRES A SYSTEM WITH SUFFICIENT INTELLIGENCE AND MOBILITY TO EFFECTIVELY LOCATE, IDENTIFY AND TRANSFER A LIMITED NUMBER OF DEVICES OF VARYING SIZE, WEIGHT AND SHAPE. ONE APPROACH IS TO SUBDIVIDE THE PROBLEM INTO TWO SYSTEMS. THE FIRST SYSTEM LOCATES A LOADING ARM IN WITHIN REACH OF A PALLET OR COMBAT VEHICLE. THE SECOND SYSTEM OPERATES AT CLOSE RANGE USING PROXIMITY AND TOUCH SENSORS TO LOCATE AND GRASP OR DEPOSIT AMMUNITION. THIS PROPOSAL DESCRIBES A PROJECT TO RESEARCH DEVELOPMENT OF A SYSTEM OF THE SECOND TYPE. A NOVEL SOFT END EFFECTOR SYSTEM (SEES) IS PROPOSED WHICH OPERATES FROM A JOINTED MANIPULATOR ARM AND CONTAINS A SENSITIVE ARRAY OF SENSORS FOR BOTH PROXIMITY AND TOUCH SENSING AND FEEDBACK CONTROL. AT CLOSE PROXIMITY AND UPON CONTACT, OBJECT SHAPE IS PERCEIVED. THE GRASPING AND PLACING FUNCTIONS ACCOUNT FOR SLIP DETECTION AND PREDETERMINED (PROGRAMMED) CORRECTIVE ACTION CAN BE MADE WITHIN SYSTEM DESIGN CAPACITY.

COMPUTATIONAL MECHANICS CONSULTANTS, INC	NAVY	\$ 49,859
3601A CHAPMAN HIGHWAY		
KNOXVILLE, TN 37920		
DR. A.J. BAKER		
TITLE:		
AN IMPROVED CFD DESIGN ANALYSIS FOR HYPERSONIC AIR-BREATHING		
ENGINE INLET ANALYSIS		
TOPIC: 33.B	OFFICE: NSSC	

THIS PROPOSAL DESCRIBES AN SBIR PROJECT TO ESTABLISH AN IMPROVED ANALYTICAL TECHNIQUE IN COMPUTATIONAL FLUID DYNAMICS (CFD) FOR CALCULATING EXTERNAL AND/OR INTERNALLY DUCTED FLOW PROPERTIES FOR HYPERSONIC ENGINE AIR INLETS. THE GOAL OF THIS PHASE I PROJECT IS TO CLEARLY CATEGORIZE THE DISTINGUISHING CHARACTERISTICS OF PUBLISHED CFD ALGORITHM CONSTRUCTIONS, WITHIN A UNIFIED THEORETICAL FRAMEWORK, FOR THE HYPERSONIC INLET AERODYNAMICS PROBLEM CLASS. THIS ANALYSIS WILL YIELD QUANTIZATION OF ALGORITHM DESIGN DISTINGUISHING FEATURES, INCLUDING GEOMETRIC VERSATILITY, (THE NEED FOR) ARTIFICIAL DIFFUSION MECHANISMS, ACCURATE INCLUSION OF VISCOTY EFFECTS IN A HIGH MACH AND HIGH REYNOLDS NUMBER FLOW, AND MAPPING TO A VECTOR COMPUTER ARCHITECTURE (EFFICIENCY). THE COMPLETION OF THE PHASE I

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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PROJECT WILL IDENTIFY AN "OPTIMAL" ALGORITHM CONSTRUCTION, IF ONE EXISTS, FOR THE CFD INLET PROBLEM CLASS, AS BASED UPON THESE MEASURES OF MERIT.

COMPUTER COGNITION 225 W 30TH STREET NATIONAL CITY, CA 92050 DR. PAMELA COKER TITLE: UTILIZATION OF LARGE SCALE OPTICAL DISKS FOR KNOWLEDGE-BASED SYSTEMS TOPIC: 9e	AF	\$ 70,000
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OFFICE: RADC/DORP

THE NEED FOR MUCH HIGHER PERFORMANCE FOR VERY LARGE DATA IS CRITICAL FOR MANY COMMERCIAL AND MILITARY APPLICATIONS. THE RESEARCH EFFORT WILL TEST THE FEASIBILITY OF DEVELOPING A COMPUTER ARCHITECTURE WHICH TAKES ADVANTAGED OF NEAR TERM 30 MB/SEC, 1-TERABYTE CAPACITY TECHNOLOGY IN OPTICAL DISK MEMORIES. THE EFFORT INCLUDES DEVELOPMENT OF SYNTACTICAL AND SEMANTIC CODES SUITABLE FOR HIGH SPEED PARSING OF OPTICAL SYSTEMS SIMULATIONS MODE WILL BE DEVELOPED WITH WHICH EXPERIMENTS INTO ALTERNATIVE ARCHITECTURES AND CONFIGURATIONS CAN BE CONDUCTED. BASED UPON THESE RESULTS, FOLLOW-UP ENGINEERING COULD RESULT IN A WORKING PROTOTYPE. THE PROJECT FOCUSSES ATTENTION ON THE NEED FOR HIGH CAPACITY DEVICES. WITH HIGH TRANSFER RATES, FOR USE IN KNOWLEDGE-BASED APPLICATIONS.

COMPUTER COGNITION 225 W 30TH STREET NATIONAL CITY, CA 92050 DR. PAMELA COKER/MARK UND TITLE: DEVELOPMENT OF A KNOWLEDGE BASED SYSTEM FOR MULTI-SENSOR CORRELATION TOPIC: 1a	ARMY	\$ 88,415
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OFFICE: ERADCOM

COMPUTER COGNITION HAS DESIGNED THE FUNCTIONAL REQUIREMENTS OF A KNOWLEDGE-BASED COMPUTERIZED SYSTEM CAPABLE OF HIGH-LEVEL ANALYSIS AND INFERENCE GENERATION FROM INCOMING PREPROCESSES SENSOR DATA OF UNKNOWN OBJECTS. TO MEET THE HIGH PERFORMANCE DEMANDS OF SUCH A

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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KNOWLEDGE BASED SYSTEM, A NEW COMPUTER ARCHITECTURE HAS BEEN DESIGNED WHICH TAKES ADVANTAGE OF EMERGING COMPUTER TECHNOLOGY SUCH AS OPTICAL DISKS WITH CAPACITY OF ONE TERABYTE AND TRANSFER RATES OF 3MB/SEC. THE FIRST PHASE OF THE RESEARCH HAS THREE OBJECTIVES: 1) TO DEVELOP A COMPUTER BASED CONTINUOUS SIMULATION MODEL OF A WORKING SYSTEM WITH CONCURRENT MULTISENSOR INPUT; 2) TO DEVELOP LINGUISTIC FRAMES AND PROTOCOLS TO ORGANIZE THE MEMORY SYSTEM AND SENTENCE PROCESSING SYSTEM; 3) TO MAP OUT PHASES, COSTS AND A TIMETABLE OF PROTOTYPE DEVELOPMENT IN THE FOLLOWING KEY AREAS: ATTENTION & COORDINATION SYSTEMS, SENTENCE PROCESSING SYSTEM, FEATURE ANALYSIS HARDWARE, ASSOCIATES, SHORT TERM MEMORY SYSTEM, INTERMEDIATE TERM MEMORY SYSTEM, LONG TERM MEMORY SYSTEM, STANDARDIZED INTERFACE TO CONVENTIONAL COMPUTER SYSTEMS SOFTWARE, AND APPLICATIONS SOFTWARE FOR MULTISENSOR PROCESSING.

COMPUTER TECHNOLOGY ASSOCIATES, INC. 5670 SOUTH SYRACUSE CIRCLE, SUITE 110 ENGLEWOOD, CO 80111 DUANE R. COCHRAN TITLE: THE DESIGN OF A RAPID, INTELLIGENT PROTOTYPING LANGUAGE (RIPL) TOPIC: 4	AF	\$ 49,232
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OFFICE: AMD/RDO

DESIGN OF EFFECTIVE MAN-MACHINE INTERFACES (MMI) IS CRITICAL TO THE OPERATIONAL EFFECTIVENESS OF INTERACTIVE COMPUTER SYSTEMS. UNFORTUNATELY, MMI DESIGN FLAWS USUALLY ARE NOT UNCOVERED UNTIL LATE IN THE IMPLEMENTATION PHASE WHEN THEIR CORRECTION IS VERY EXPENSIVE OR IMPOSSIBLE. FREQUENTLY, HUMAN FACTORS DESIGN DATA ARE OFTEN NOT TAKEN INTO ACCOUNT BY TYPICAL MMI DESIGNERS. RAPID PROTOTYPING TOOLS HAVE BEEN USED TO ALLEVIATE THESE PROBLEMS BY ALLOWING MMI DESIGNS TO BECOME VISIBLE AND MODIFIABLE EARLY IN THE SYSTEM DEVELOPMENT PROCESS. CTA PROPOSES TO ADVANCE THE STATE OF THE ART IN RAPID PROTOTYPING TECHNOLOGY BY EXTENDING IT IN FOUR DISTINCT AREAS: 1) EXPERT SYSTEM FOR MMI DESIGN; 2) INSTRUMENTATION OF THE PROTOTYPE TO MEASURE HUMAN PERFORMANCE; 3) RECONFIGURATION TO HANDLE A BROAD RANGE OF MMI APPLICATIONS; AND 4) AUTOMATIC GENERATION OF MMI DISPLAY MANAGEMENT SOFTWARE. CTA WILL DESIGN A RAPID, INTELLIGENT PROTOTYPE LANGUAGE (RIPL) THAT INCLUDES ALL OF THESE NEW CAPABILITIES. THE EXPERT SYSTEM FOR MMI DESIGN IS THE MOST SIGNIFICANT AND UNIQUE FEATURE OF RIPL. IT

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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WILL PROVIDE ON-LINE EXPERT ASSISTANCE TO THE MMI DESIGNER. DESIGN RECOMMENDATIONS WILL BE MADE BY THIS EXPERT SYSTEM BASED ON RELEVANT DESIGN OPTIONS FROM THE SUPPORTING KNOWLEDGE BASE.

COMPUTER TECHNOLOGY ASSOCIATES, INC. 5670 S. SYRACUSE CIRCLE, SUITE 110 ENGLEWOOD, CA 22217 REGINALD N. MEESON JR.	NAVY	\$ 64,901
TITLE: INVESTIGATION OF FUNCTIONAL PROGRAMMING IN DEFENSE APPLICATIONS		
TOPIC: 119 OFFICE: ONR		

THE DOD SOFTWARE INITIATIVE CLEARLY IDENTIFIED THE CHALLENGES FOR FUTURE SOFTWARE SYSTEMS. THEY WILL HAVE TO BE LARGER AND MORE COMPLEX DEVELOPED AND DELIVERED MORE RAPIDLY, AND MAINTAINED OVER LONGER PERIODS. TRADITIONAL PROGRAMMING TECHNIQUES, HOWEVER, APPEAR TO HAVE REACHED THEIR LIMITS, MAKING MUCH LARGER SOFTWARE SYSTEMS VIRTUALLY IMPOSSIBLE TO BUILD AND MAINTAIN. AN ALTERNATIVE APPROACH, CALLED FUNCTIONAL PROGRAMMING, HAS BEEN PROPOSED TO OVERCOME THE DEVELOPMENT AND MAINTENANCE DIFFICULTIES OF TRADITIONAL SOFTWARE DEVELOPMENT TECHNIQUES. THE OBJECTIVES OF THIS PROJECT ARE TO EVALUATE THE FEASIBILITY OF FUNCTIONAL PROGRAMMING IN DEFENSE-RELATED APPLICATIONS AND TO ACCESS THE MAINTAINABILITY OF FUNCTIONAL PROGRAMS. FOR THE FIRST PHASE, FOUR SMALL PROGRAMS WILL BE DEVELOPED TO IDENTIFY THE TYPES OF APPLICATIONS WHERE FUNCTIONAL PROGRAMMING MAY PROVIDE SIGNIFICANT ADVANTAGES. THIS WORK WILL INCLUDE STANDARDIZING A NOTATION FOR FUNCTIONAL PROGRAMS, REFINING A METHODOLOGY FOR THEIR DEVELOPMENT, AND MONITORING ERRORS AND CHANGES MADE DURING THE PROGRAMMING PROCESS. IN THE SECOND PHASE A TRANSLATOR/PROCESSOR WILL BE DEVELOPED TO RUN AND TEST THE EXAMPLE PROGRAMS. IN ADDITION, A LARGER PROGRAM, ON THE ORDER OF 10,000 CONVENTIONAL HIGH-LEVEL LANGUAGE STATEMENTS, WILL BE DEVELOPED IN PHASE II TO MORE THOROUGHLY EVALUATE THE MAINTAINABILITY OF FUNCTIONAL PROGRAMS.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
CREW SYSTEMS CONSULTANTS P.O. BOX 481 YELLOW SPRINGS, OH 45387 RICHARD L. NEWMAN TITLE: IMPROVEMENT OF HEAD-UP DISPLAY STANDARDS TOPIC: 19a OFFICE: ASD/ENO	AF	\$ 48,500

HEAD-UP DISPLAYS (HUDS) ARE OPTICAL DISPLAYS WHICH PRESENT FLIGHT INFORMATION IN THE PILOTS FORWARD VIEW. THESE DISPLAYS ARE OUT-GROWTHS OF REFLECTING GUN OR BOMBSIGHTS. ALTHOUGH THEY WERE DESIGNED FOR WEAPON DELIVERY, PILOTS FIND THEM QUITE USEFUL AS PRIMARY FLIGHT REFERENCES. RECENT SURVEYS, HOWEVER, REVEAL CERTAIN PROBLEMS. BASED ON REACTIONS, PRESENT DAY HUD SPECIFICATIONS DO AN INADEQUATE JOB OF CONTROLLING THE BRIGHTNESS AND LOCATION OF THE DESIGN EYE. THEY ALSO DO NOT ADEQUATELY SPECIFY THE DYNAMIC MOTION OF THE SYMBOLS -- THE CONTROL LAWS, FURTHER, NO TWO HUDS HAVE THE SAME SET OF SYMBOLS. THE RESULT OF THIS IS APPARENT CHAOS. PART OF THE PROBLEM SEEMS TO BE CAUSED BY A LACK OF A HUD DATA BASE OR EVEN CONSISTENT SPECIFICATIONS. THIS PROPOSAL RECOMMENDS ESTABLISHING SUCH A DATA BASE OR SOURCE DOCUMENT FOR FUTURE HUDS. FURTHER, SINCE THE CONTROL LAWS ARE SO IMPORTANT, AND ARE PRESENTLY UNSPECIFIED, THE PROPOSED PROGRAM WILL SEEK TO DETERMINE IF THERE IS A CORRELATION BETWEEN "GOOD" HUDS AND "BAD" HUDS. THIS WILL BE DONE USING FLIGHT TEST DATA ALREADY AVAILABLE.

CRYSTAL SYSTEMS, INC. 35 CONGRESS STREET SALEM, MA 01970 CHANDRA P. KHATTAK TITLE: DIRECTIONAL SOLIDIFICATION OF ALUMINUM OXYNITRIDE (ALON) FROM THE MELT BY THE HEAT EXCHANGER METHOD (HEM) TOPIC: 7g OFFICE: DIR, AMMRC	ARMY	\$ 49,502
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ALUMINUM OXYNITRIDE SPINEL (ALON) HAS BEEN SINTERED INTO TRANSPARENT, POLYCRYSTALLINE FORM. THE POLYCRYSTALLINE FORM EXHIBITS LIGHT SCATTER AT GRAIN BOUNDARIES AND PORES. THE PRESENT PROPOSAL IS AN EFFORT TO ESTABLISH FEASIBILITY OF PRODUCING ALON FROM THE MELT BY A CONTROLLED

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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SOLIDIFICATION USING THE HEAT EXCHANGER METHOD (HEM). THIS IS EXPECTED TO PRODUCE LARGE, COLUMNAR GRAIN STRUCTURE MATERIAL DEVOID OF POROSITY AND, THEREFORE, EXHIBITING SUBSTANTIALLY LESS LIGHT SCATTER. THIS REQUIREMENT IS IMPORTANT FOR USE OF ALON AS MULTI-MODE MISSILE GUIDANCE WINDOW APPLICATIONS. THE PROPOSED WORK WILL BE COORDINATED WITH THE BASIC WORK DONE AT ARMY MATERIALS AND MECHANICS RESEARCH CENTER AND THE APPLICATION REQUIREMENTS AT NAVAL WEAPONS CENTER, CHINA LAKE, CA.

CUMAGNA CORPORATION 26 S. WAKEFIELD ROAD NORRISTOWN, PA 19403 ROBERT A. FLORENTINE TITLE: MAGNABEAMS - STRUCTURAL MEMBERS BY THE MAGNAWEAVE PROCESS TOPIC: 7x	ARMY	\$ 48,000
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MAGNAWEAVE PROCESS (USP 4,312,261) CAN PRODUCE FIBROUS PREFORMS FOR REINFORCED COMPOSITES IN SHAPES THAT HAVE EXCEPTIONAL MECHANICAL PROPERTIES, WHILE ELIMINATING ANY DELAMINATION FAILURE MECHANISM. THE PROCESS IS EXCEPTIONALLY SUITABLE FOR THE MANUFACTURE OF LIGHT WEIGHT, HIGH PERFORMANCE STRUCTURAL MEMBERS FOR CORPS OF ENGINEERS REQUIREMENTS - LIGHT WEIGHT, MOBILITY, HIGH PERFORMANCE. PHASE I WILL GENERATE THE MECHANICAL PROPERTIES OF A SERIES OF MAGNAWEAVE COMPOSITES, TO PROVIDE A DATA BASE FOR PHASE II DESIGN AND DEVELOPMENT EFFORT FOR MAXIMUM EFFICIENCY LIGHT WEIGHT STRUCTURAL COMPOSITE BEAMS. THE DATA WILL ESTABLISH THE SUITABILITY OF THE PROCESS TO MAKE THESE SHAPES, AND GIVE AN IDEA OF THE POTENTIAL ADVANTAGES FROM USING THE PROCESS. A PHASE II PROGRAM PLAN WILL BE THE END RESULT.

CYBER DYNAMICS INCORPORATED 1000 ELWELL COURT, SUITE 212 PALO ALTO, CA 94303 FREDERICK L. BECKNER TITLE: DEVELOPMENT OF A HIGH POWER MMW LINEAR FM PULSE COMPRESSION SYSTEM TOPIC: 8g	ARMY	\$ 49,615
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AN OPTICAL ADJUNCT ADD-ON MILLIMETER-WAVE (MMW) RADAR IS BEING CONSIDERED BY THE ARMY FOR RANGING TO INCOMING REENTRY VEHICLES AND DECOY DISCRIMINATION BECAUSE OF THE LONG RANGE, LIMITED ANTENNA APERTURE, AND LOW TARGET CROSS SECTION, A LARGE TRANSMITTED ENERGY

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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IS REQUIRED TO ACHIEVE ACCEPTABLE SIGNAL-TO-NOISE RATIOS. LIMITATIONS ON THE PEAK POWER ACHIEVABLE AT MILLIMETER WAVELENGTHS LEADS TO A REQUIREMENT FOR A HIGH POWER MMW PULSE COMPRESSION SYSTEM CAPABLE OF PULSE COMPRESSION RATIOS IN EXCESS OF 200,000:1. CYBERDYNAMICS INCORPORATED HAS DEVELOPED A FULLY-COHERENT MMW LINEAR FM PULSE COMPRESSION SYSTEM WHICH, THROUGH THE USE OF ADAPTIVE TECHNIQUES, HAS DEMONSTRATED PERFORMANCE SUPERIOR TO ANY PRIOR ART. CYBERDYNAMICS INCORPORATED PROPOSES TO PERFORM A SYSTEM CONCEPT DEFINITION AND TECHNICAL RISK ASSESSMENT, AND TO DEVELOP A FEASIBILITY DEMONSTRATION PLAN FOR THE DEVELOPMENT OF A HIGH POWER MMW LINEAR FM PULSE COMPRESSION SYSTEM BASED ON THESE ADAPTIVE TECHNIQUES.

DAEDALEAN ASSOCIATES, INC. 15110 FREDERICK ROAD WOODBINE, MD 21797 ROBERT S. WEINREICH TITLE: THE DEVELOPMENT OF THE INTERNAL FRICTION DAMPING NON-DESTRUCTIVE EVALUATION TECHNIQUE AS A FATIGUE INDICATOR FOR MILITARY BRIDGES TOPIC: 7s	ARMY	\$ 49,170
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A NONDESTRUCTIVE TEST TECHNIQUE WHICH HAS THE POTENTIAL FOR MEASURING THE DEGREE OF FATIGUE IN MILITARY BRIDGE STRUCTURES HAS BEEN IDENTIFIED BY US. THE TECHNIQUE IS CALLED INTERNAL FRICTION DAMPING NON-DESTRUCTIVE EVALUATION. THE PHYSICAL PROPERTY THAT IS MONITORED IN THIS TECHNIQUE IS THE RATE AT WHICH AN ENERGY IMPULSE IMPARTED TO A MATERIAL OR STRUCTURE DECAYS DUE TO THE INTERNAL FRICTION OF THE MATERIAL. A CHANGE IN THE RATE OF DECAY REFLECTS CHANGES IN THE BASIC CHEMICAL AND/OR MECHANICAL PROPERTIES OF THE MATERIAL DUE TO AN ACCUMULATION OF SUBTLE MATERIAL VARIABLES. THESE MATERIAL VARIABLES INCLUDE THE GRAIN SIZE, CHEMICAL COMPOSITIONS, INTERSTITIAL ELEMENTS, DISLOCATIONS, PRECIPITATE PARTICLES, STRAIN RATE EFFECTS, ETC. BY PROPER MONITORING OF THE ACCUMULATION OF THESE INSIDIOUS VARIABLES, IT IS POSSIBLE TO PREDICT THE REMAINING USEFUL LIFE OF A MATERIAL BEFORE FAILURE OCCURS. IT IS THE OBJECTIVE OF THE FIRST PHASE OF THIS PROGRAM TO ADAPT THIS TECHNIQUE TO MILITARY BRIDGES BY FIRST IDENTIFYING THE CHARACTERISTICS DAMPING COEFFICIENT VERSUS FATIGUE LIFE CURVE FOR BAR SPECIMENTS OF THE MATERIALS USED IN THE BRIDGES AND THEN DEMONSTRATING ITS SUCCESSFUL APPLICATION BY FATIGUING A FULL SIZED BRIDGE GIRDER AND COMPARING THE DAMPING COEFFICIENTS DURING ITS

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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FATIGUE LIFE TO THOSE OBTAINED WITH THE BAR SPECIMENS.

DATASONICS, INC. PO BOX 8, 1400 ROUTE 28A CATAUMET, MA 02534 WILLIAM L. DALTON TITLE: DIVER HAND HELD UNDERWATER POSITIONING SYSTEM TOPIC: 72	NAVY	\$ 35,000
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OFFICE: NSSC

A REQUIREMENT EXISTS FOR AN ECONOMICAL SYSTEM OF AREA NAVIGATION FOR USE BY DIVERS IN A VARIETY OF MILITARY AND COMMERCIAL APPLICATIONS. WE PROPOSE TO DEVELOP AN ACOUSTIC TRANSPONDER BASED RANGE/RANGE TYPE OF NAVIGATION SYSTEM WITH INCREASED CAPABILITY IN TERMS OF POSITION ACCURACY, DIVER POSITION DISPLAY CONTENT AND EASE OF DEPLOYMENT, RECOVERY, AND SYSTEM CALIBRATION. MAJOR OBJECTIVES IN THE SYSTEM DESIGN ARE TO PROVIDE THE DIVER WITH A "LORAN LIKE" CAPABILITY IN A SMALL, RELIABLE, EASY TO OPERATE CONFIGURATION SO AS TO NOT RESTRICT THE DIVERS MOVEMENT AND OVERALL SUB SEA WORK CAPABILITY. GOALS OF THE PHASE 1 RESEARCH EFFORT WILL BE TO DEFINE THE SPECIFIC REQUIREMENTS OF THE DIVER HELD INTERROGATOR/DISPLAY UNIT, ASSUMING INTEGRATION OF A NEW LOW POWER MICRO-PROCESSOR TECHNOLOGY. THE RESULTING INTERROGATOR/PROCESSOR UNIT SHOULD ALLOW THE DIVER TO ACCESS A SITUATION DISPLAY WHICH WILL PROVIDE POSITION INFORMATION AND A VARIETY OF RELATED USEFUL NAVIGATION INFORMATION. OTHER MAJOR OBJECTIVES ARE THE RETENTION OF SIMPLICITY OF OPERATION IN AN INSTRUMENT WHICH WILL HAVE A HIGH LEVEL OF PROCESSING CAPABILITY AND PACKAGING OF THE INSTRUMENT FOR DIVER USE. MEETINGS WITH REPRESENTATIVES OF APPROPRIATE NAVY LABORATORIES ARE PROPOSED IN ORDER TO INCORPORATE USER INPUT INTO THE SYSTEM DESIGN.

DECISION SCIENCE CONSORTIUM, INC. 7700 LEESBURG PIKE, SUITE 421 FALLS CHURCH, VA 22043 JAMES O. CHINNIS, JR. TITLE: EXPERIMENTAL RESEARCH ON COGNITIVE TASKS AND THE DESIGN OF SOLDIER-MACHINE INTERFACE TOPIC: 5j	ARMY	\$ 62,000
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OFFICE: ARI/PERI-PO

DSC PROPOSES TO CONDUCT RESEARCH RELATED TO THE DEVELOPMENT OF DESIGN GUIDELINES FOR THE OPTIMUM ALLOCATION OF COGNITIVE TASKS TO THE HUMAN AND THE MACHINE IN COMPUTER-BASED ARMY SYSTEMS. OUR THESIS IS THAT MORE CAPABILITY OF A MACHINE TO PERFORM COGNITIVE TASKS IS NOT SUFFICIENT.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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FICIENT CAUSE TO ALLOCATE SUCH TASKS TO MACHINES: INSTEAD, THE COGNITIVE TASKS ALLOCATED TO THE MACHINE COMPONENT OF A SYSTEM MUST MESH COMFORTABLY WITH THE COGNITIVE SUPPORT NEEDS AND COGNITIVE TASKS OF THE HUMAN COMPONENT. WE PROPOSE TO IDENTIFY THE KEY TASK ELEMENTS OF CONCERN, EXPLORE IMPLICATIONS OF ALTERNATIVE HUMAN-MACHINE TASK ALLOCATION SCHEMES, SELECT AN APPROPRIATE ARMY CONTEXT, AND DEVELOP AND DEMONSTRATE THE EFFECTIVENESS OF ALTERNATIVE ALLOCATION SCHEMES. THE PROTOTYPE SYSTEM WILL PROVIDE THE BASIS FOR PRELIMINARY WORK IN PHASE I AND MORE DEFINITIVE WORK IN PHASE II AIMED AT THE EXPERIMENTAL DEVELOPMENT OF DEFENSIBLE DESIGN GUIDELINES FOR THE ALLOCATION OF HIGHER-ORDER TASKS BETWEEN HUMAN AND MACHINE IN FUTURE ARMY SYSTEMS.

DECKER ENGINEERING, INC. 316 PALM DRIVE HERMOSA BEACH, CA 90254 RICHARD A. DECKER TITLE: SUCTION DEVICE TOPIC: 6x	ARMY	\$ 7,010
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OFFICE: SGRD-MRDC

DECKER PROPOSES TO DEVELOP A LIGHTWEIGHT SELF-CONTAINED VACUUM PUMPING UNIT CAPABLE OF DRAWING 10 TO 100 cm OF WATER. THE DEVICE WILL USE RUBBER BALL SEALING TECHNOLOGY TO KEEP SIZE AND COST TO A MINIMUM, AS WELL AS TO REDUCE MAINTENANCE ACTIONS.

DEFENSE SYSTEMS, INC 6804 POPLAR PLACE, SUITE 100 MCLEAN, VA 22101 DR GEORGE S SEBESTYEN TITLE: SIGINT SENSOR FOR SHIPLAUNCHED RPV'S TOPIC: 110	NAVY	\$ 49,964
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OFFICE: NASC

THE SIGINT SENSOR FOR SHIPLAUNCHED RPV'S WILL 1) PROVIDE LOW COST COMMUNICATIONS INTERCEPT CAPABILITY, TO DETECT, ANALYZE, AND GEO-LOCATE ENEMY COMMUNICATIONS; 2) JAM SELECTED ENEMY COMMUNICATIONS; AND 3) EMULATE U.S. NAVAL COMMUNICATIONS TO DECOY ENEMY FORCES.

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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THIS EXTREMELY LIGHTWEIGHT MINIATURE PAYLOAD WILL IN A FRACTION OF A SECOND, SWEEP ACROSS THE MILITARY UHF BAND, DETECT, ANALYZE, PRECISELY LOCK-ON, AND JAM ENEMY TRANSMISSIONS WITH THE OPTIMUM WAVEFORM. ALL FUNCTIONS ARE PROGRAMMABLE REMOTELY THROUGH A COMMAND (TIME-SHARED-INTERCEPT) RECEIVER. THE TIME HISTORY AND CHARACTERISTICS OF THE SIGNAL ENVIRONMENT ARE RECOVERABLE BY THE TIME-SHARED (DATA LINK) USE OF THE JAMMER TRANSMITTER. SPEED OF INTERCEPT, ACHIEVED THROUGH COMBINING FAST AND MODERATE SLEW RATES IN THE DIGITAL SYNTHESIZER; THE PRECISE SET-ON CAPABILITY AND THE LOW COST DESIGN APPROACH MAKE THE PROPOSED SIGINT SYSTEM UNIQUE. ANALYSIS, DESIGN, COSTING AND RECEIVER BREADBOARDING WILL BE DONE IN PHASE I. COMPLETE SIGINT SENSOR FOR SHIPLAUNCHED RPV'S WILL BE DEVELOPED AND TESTED IN PHASE 2.

DEFENSE SYSTEMS, INC.
6804 POPLAR PLACE, SUITE 100
MCLEAN, VA 22101
DONALD L. STARKEY

NAVY \$ 49,928

TITLE:
ON-THE-BOTTOM SURVEILLANCE BUOY
TOPIC: 112 OFFICE: NASC

A SONOBUOY ON THE BOTTOM OF THE OCEAN CAN ACHIEVE LONG DETECTION RANGES BY USE OF THE RELIABLE ACOUSTIC PATH (RAP). BY PUTTING AN ACOUSTIC SIGNAL PROCESSOR IN THE BUOY TO DO SPECTRUM ANALYSIS AND CONTRACT REPORT GENERATION, THE DATA TRANSMITTED TO SURVEILLANCE AIRCRAFT CAN BE REDUCED TO SHORT BURSTS ON A SCHEDULE THAT MEETS PATROL AIRCRAFT REVISIT REQUIREMENTS FOR INCREASED AIRCRAFT UTILIZATION AT LOWER COST. EMPLOYING ACOUSTIC COMMUNICATIONS FROM THE BOTTOM SENSOR TO A STANDARD PASSIVE BUOY DEPLOYED BY THE READOUT AIRCRAFT (AND SERVING AS A COMMUNICATIONS RELAY) CAN ELIMINATE THE HIGH COST AND OFTEN UNRELIABLE ELECTROMECHANICAL LINK OF MOORED BUOYS. A BUOY COST SAVING IN EXCESS OF 80% AND AN AIRCRAFT OPERATING COST REDUCTION BY A FACTOR OF 4 IS ESTIMATED. DEFENSE SYSTEMS, INC. DESIGNED AND BUILT A LOW POWER CONSUMPTION ACOUSTIC SIGNAL PROCESSOR FOR SUCH A BUOY AND DID MANY OF THE TRADEOFF ANALYSES NEEDED BY A DETAILED ENGINEERING DESIGN. THIS EFFORT WILL INTEGRATE DESIGNS OF DEEP ACOUSTIC SENSORS, THE SIGNAL PROCESSOR, THE ACOUSTIC LINK AND THE

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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MECHANICAL STRUCTURE TO WITHSTAND 15,000 FOOT DEPTH INTO AN ON-THE-BOTTOM SURVEILLANCE BUOY. THE DESIGN WILL BE SUPPORTED BY TRADE-OFF AND COST EFFECTIVENESS ANALYSES AND WILL RESULT IN A PRELIMINARY DESIGN REVIEW REPORT. DSI WILL ALSO CONSTRUCT IN PHASE 1, A WORKING FEASIBILITY DEMONSTRATION BUOY.

DEFENSE SYSTEMS, INC. 6804 POPLAR PLACE MCLEAN, VA 22101 DR. HENRY MULLANEY TITLE: LONG HAUL HF COMMAND/DATA LINK FOR BUOYS TOPIC: 111	NAVY	\$ 54,500
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OFFICE: NASC

PRESENT DATA RECOVERY FROM ASW BUOYS REQUIRES THE PRESENCE OF P-3 AIRCRAFT. ALTHOUGH LOW EARTH ORBIT SATELLITE READOUT IS FEASIBLE, THE AVERAGE BIT RATE IS LOW, AND IS NOT REAL TIME. WE PROPOSE THE DEVELOPMENT OF A REAL TIME 2000 MILE HF DATA LINK FOR REMOTE BUOYS. A PRACTICAL HF BUOY LINK MUST USE SHORT NARROWBAND ANTENNAS THAT CAN BE TUNED ACROSS THE BAND TO THE OPTIMUM FREQUENCY. WE PROPOSE A UNIQUE MODULATION WAVEFORM TO MINIMIZE PEAK TRANSMIT POWER AND MINIMIZE FADING EFFECTS. THROUGH PROPER BUOY FIELD MANAGEMENT AND FREQUENCY CONTROL FROM SHORE, A LARGE FIELD OF BUOYS CAN BE SERVICED BY A SINGLE SHORE SITE WITH VERY MODEST SPECTRUM OCCUPANCY REQUIREMENTS WHILE MINIMIZING JAMMING AND INTERFERENCE EFFECTS. IN PHASE 1, WE WILL DESIGN THIS NOVEL BUOY COMMUNICATION SYSTEM, CONSTRUCT BREADBOARD HARDWARE AND LABORATORY TEST THE HF LINK. IN PHASE 2, WE WILL FIELD TEST AND PACKAGE THE SYSTEM IN A BUOY AND WILL TEST IT AT SEA.

DEFENSE SYSTEMS, INC. 6804 POPLAR PLACE MCLEAN, VA 22101 GEORGE S. SEBESTYEN TITLE: ADVANCED UNDERSEA TACTICAL COMMUNICATIONS TECHNIQUES TOPIC: 5A	DARPA	\$ 60,182
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OFFICE: DARPA

THERE IS AN INCREASING NEED FOR LONG RANGE (200km) APPROXIMATELY 10 BPS RATE ACOUSTIC COMMUNICATION AT LOW BIT ERROR RATES IN THE COMMAND AND CONTROL OF ACOUSTIC SURVEILLANCE SYSTEM ELEMENTS, UNDERWATER VEHICLES AND SENSORS. SIMULATED FISH NOISE, CODED TONE AND MULTITONE

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>CW SIGNALS HAVE BEEN USED WITH VARYING SUCCESS. ONLY THE M-ary, MULTITONE, LONG BAND LOW FREQUENCY WAVEFORMS ARE PRACTICAL FOR LONG RANGE COMMUNICATIONS. HOWEVER, THE DEPENDENCE OF AMBIENT NOISE VS FREQUENCY, PROPAGATION LOSS VS RANGE, TRANSDUCER EFFICIENCY AND SIZE VS FREQUENCY AND TOTAL BANDWIDTH OCCUPIED MUST BE CONSIDERED IN THE ACOUSTIC LINK DESIGN. PHASE 1 OF THIS RESEARCH WILL PERFORM AND DOCUMENT THE TRADEOFFS THAT LEAD TO PRACTICAL COMMUNICATIONS SYSTEMS DESIGNS AND WILL PRODUCE A HANDBOOK OF MONOGRAPHS THAT WILL PERMIT THE USER TO SELECT THE SYSTEM VARIABLES THAT BEST SUIT THE APPLICATION AT HAND. THE RESULTS OF THIS ANALYSIS ARE THEN GOING TO BE APPLIED TO THE COMMAND AND CONTROL OF DISTRIBUTED SENSORS IN HOSTILE AREAS. PHASE 1 EFFORT WOULD PROVIDE THE FIRST DOCUMENTED ANALYSIS OF TRANSMITTER, POWER AND VOLUME REQUIREMENTS NEEDED FOR LONG LIFE REMOTE SENSORS. PHASE 2 WILL FABRICATE A PROTOTYPE TO BE DEMONSTRATED AT SEA.</p>		

DESIGNERS & PLANNERS, INC. 1725 JEFFERSON DAVIS HIGHWAY, SUITE 700 ARLINGTON, VA 22202 DR. P.Y. CHANG TITLE: DESIGN METHODS FOR SHIPS STRUCTURAL RESPONSE TO EXTREME SEAWAY LOADINGS TOPIC: 47	NAVY	\$ 52,486
OFFICE: NSSC		

ACCURATE PREDICTION OF THE STRUCTURAL RESPONSES OF SHIPS TO EXTREME SEAWAY LOADINGS IS IMPORTANT IN THE EARLY PHASES OF SHIP DESIGN. THE CURRENTLY USED METHODS, IN GENERAL, ARE NOT ACCURATE ENOUGH. THE ROSAS3 PROGRAM IS THE BEST AVAILABLE, BUT HAS CERTAIN LIMITATIONS AND IS DIFFICULT FOR DESIGN ENGINEERS TO USE. THIS PROPOSAL PRESENTS A SYSTEMATIC APPROACH AND FEASIBLE PLAN TO IMPROVE THE ROSAS3 PROGRAM: MORE COMPREHENSIVE DOCUMENTATION WILL BE PREPARED; A PRE-PROCESSOR WILL BE DEVELOPED SO THAT MOST OF THE DIFFICULT INPUT DATA WILL BE CALCULATED BY THE COMPUTER THROUGH SHCP AND SMP; ROSAS3 WILL BE MODIFIED TO INCREASE ITS ACCURACY AND IMPROVE THE EFFICIENCY OF ITS USE.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
DIGICOMP RESEARCH CORPORATION TERRACE HILL ITHACA, NY 14850 JAMES ELKINS TITLE: A SYSTEM ARCHITECTURE FOR A MICRO PROCESSOR BASED MULTI-LEVEL SECURE COMPUTER SYSTEM TOPIC: 15d OFFICE: ESD/ALEE	AF	\$ 48,072

THIS EFFORT ADDRESSES ONE ASPECT OF THE MULTIFACETED COMPUTER SECURITY PROBLEM. A HARDWARE/SOFTWARE SYSTEM ARCHITECTURE WILL BE DEVELOPED FOR A SMALL STAND ALONE MICROPROCESSOR BASED MULTILEVEL SECURE (MLS) COMPUTER SYSTEM. THE SOFTWARE VERIFICATION METHODOLOGIES NORMALLY HEAVILY RELIED ON IN PRODUCING MLS SYSTEMS, ARE ACTUALLY STILL IN THEIR INFANCY. WE SUGGEST HERE A HARDWARE ARCHITECTURE THAT IS INTENDED TO SIGNIFICANTLY REDUCE THE AMOUNT OF VERIFICATION REQUIRED.

MICROCOMPUTERS HAVE BECOME A HOUSEHOLD ITEM. THE GENERAL PUBLIC (AND CONSEQUENTLY THE AVAILABLE POOL OF PERSONNEL FOR DoD) IS GETTING USED TO A WIDE BASE OF COMMERCIAL SOFTWARE, E.G., CP/M AND UNIX OPERATING SYSTEMS, VISICALC, DATA BASES, ETC. IT WOULD BE EXTREMELY ATTRACTIVE IF A MLS COMPUTER SYSTEM COULD UTILIZE THIS SOFTWARE BASE WITHOUT THE EXPENSIVE COST OF RETROFITTING IT WITH MLS FEATURES. DIGICOMP'S APPROACH FOR A TRUSTED MLS SYSTEM OFFERS THIS ATTRACTIVE FEATURE AS WELL.

PHASE I SHALL DEVELOP THE HARDWARE/SOFTWARE ARCHITECTURE. THE NECESSARY SECURITY MODEL AND THE VERIFICATION METHODOLOGY WILL ALSO BE IDENTIFIED FOR THE RECOMMENDED ARCHITECTURE AND A VERIFICATION PLAN DEVELOPED. PHASE II CONSISTS OF THE DEVELOPMENT OF SOFTWARE PROTOTYPES AND THE REQUIRED SPECIFICATIONS AND VERIFICATIONS.

DIGITAL RADIO CORPORATION (DIRAD) 8901 LA CIENEGA BLVD INGLEWOOD, CA 90301 OLIVER W. SAUNDERS TITLE: ARCHITECTURE STUDY FOR A MILSTAR EHF TERMINAL WITH HF BACK-UP CAPABILITY TOPIC: 90 OFFICE: NAVELEX	NAVY	\$ 47,639
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A HF RADIO ARCHITECTURE EXIST THAT WILL SIGNIFICANTLY AID THE NAVY IN PERFORMING MAJOR UPGRADES TO THEIR OVERALL COMMUNICATIONS NETWORK AND REDUCE THE NUMBER OF DIFFERENT TYPE HF RADIOS PRESENTLY DEPLOYED. THE ARCHITECTURE IS BASED ON THE APPLICATION OF I AND Q BANDWIDTH

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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SAMPLING, DIGITAL IMPLEMENTATION OF FREQUENCY TRANSLATION, FILTERING, MODULATION AND DEMODULATION AND BASEBAND SIGNAL PROCESSING TECHNIQUES. ADDITIONALLY, THE ARCHITECTURE IS SOFTWARE RECONFIGURABLE TO MEET ALL HF APPLICATIONS. IN PARTICULAR, THE PERFORMANCE ACHIEVABLE USING DIGITAL FILTERING AND SIGNAL PROCESSING TECHNIQUES FAR EXCEED THAT OF ITS ANALOG COUNTERPART. BITE AND ILS OPPORTUNITIES ARE ALSO SIGNIFICANT DUE TO THE PRIMARILY DIGITAL IMPLEMENTATION AND MODULARITY. A MULTI-INCREMENT TUNING SCHEME IS INCORPORATED WHOSE FINAL STAGE (FINE TUNING 10 Hz STEPS) IS IMPLEMENTED DIGITALLY. DUE TO THE UNIQUE CHARACTERISTICS OF EACH USERS INTERFACE, A PROGRAMMABLE INTERFACE PROCESSOR IS INCLUDED TO HANDLE CLOCK RATE CHANGES, FORMAT CONTROL, INTERFACE PROTOCOL AND DATA BUFFERING UNDER SOFTWARE CONTROL.

DOTY ASSOCIATES, INC. 451 HUNGERFORD DRIVE ROCKVILLE, MD 20850 AREVE B. ALEXANDER TITLE: ANALYTICAL DECISION MAKING SOFTWARE - PHASE I TOPIC: 114	NAVY	\$ 37,364
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OFFICE: NASC

AN AUTOMATED DECISION AID, USEABLE ON A MINICOMPUTER WILL BE DEVELOPED TO ANALYZE PROJECT COST, TAKING INTO ACCOUNT QUANTITIES, DELIVERY SCHEDULES, AND OTHER PROGRAMMATIC AND ECONOMIC VARIABLES. THE PROTOTYPE MODEL DEVELOPED IN PHASE I WILL INCLUDE A PROTOTYPE DATA BASE WHICH THE MODEL CAN MANIPULATE TO OBTAIN SUBSYSTEM COST INPUTS. THE MAJOR OBJECTIVES IN PHASE I ARE TO DEMONSTRATE THE TECHNICAL FEASIBILITY OF DEVELOPING THIS TYPE OF SOFTWARE AND TO DEMONSTRATE ITS ACCEPTABILITY WITHIN THE POTENTIAL USER COMMUNITY. TO ACHIEVE THE LATTER OBJECTIVE, INDIVIDUAL DEMONSTRATIONS TO POTENTIAL USERS WILL BE PERFORMED, WITH THEIR REACTIONS AND SUGGESTIONS RECORDED, TO BE ACTED UPON IN PHASE II IF APPROPRIATE. A SIMULATION TO CHECK ON THE REALISM OF THE MODEL OUTPUT WILL ALSO BE CONDUCTED.

DR. PRADEEP K. GUPTA 117 SOUTHBURY ROAD CLIFTON PARK, NY 12065 DR. PRADEEP K. GUPTA TITLE: OPTIMIZING MANUFACTURING TOLERANCES IN ROLLING BEARINGS FOR CRITICAL DOD APPLICATIONS TOPIC: 11i	AF	\$ 36,970
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OFFICE: AFWL/XRP-PO

A REALISTIC DETERMINATION OF THE MANUFACTURING TOLERANCES ON THE DIMENSIONS OF THE VARIOUS ELEMENTS IN A ROLLING BEARING IS PROPOSED THROUGH COMPUTER MODELING OF THE DYNAMIC PERFORMANCE OF THE BEARING AS FUNCTION OF THE GEOMETRICAL ANOMALIES. THE BEARING MODEL CONSISTS

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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OF A REAL-TIME SIMULATION OF THE BEARING PERFORMANCE AS OBTAINED BY INTEGRATING THE DIFFERENTIAL EQUATIONS OF MOTION OF EACH BEARING ELEMENT UNDER ARBITRARY OPERATING CONDITIONS. THE VARIATION IN THE GEOMETRY OF EACH ELEMENT CAN BE INDEPENDENTLY PRESCRIBED. THE FIRST PHASE OF THE PREPOSED EFFORT IS AIMED AT INVESTIGATING THE EFFECTS OF ROLLING ELEMENT SIZE VARIATION, RACE WAVINESS OR OUT-OF-ROUNDNESS, RACE GROOVE CURVATURE VARIATION IN BALL BEARINGS, CENTRALITY OF FLAT LAND AND LAND TAPER IN ROLLER BEARINGS.

DYNACOM COMPANY
1417 COFFEYVILLE TR.
PLANO, TX 75023
TIMOTHY R. MINOR

ARMY \$ 39,600

TITLE:
ADAPTIVE NOISE CANCELLATION HEADSET WITH APPLICATIONS IN COMBAT VEHICLES
TOPIC: 7rr OFFICE: TACOM

A VARIETY OF ELECTRICAL/HYDRAULIC MOTORS, PUMPS, FANS, AND BLOWERS EMPLOYED WITHIN COMBAT VEHICLES IMPOSE UNACCEPTABLE NOISE LEVELS ON CREW MEMBERS. THIS INVESTIGATION ADDRESSES DEVELOPMENT AND EVALUATION OF A PROTOTYPE NOISE REDUCTION PROCESSOR SUITABLE FOR LATER IMPLEMENTATION WITHIN A SELF-CONTAINED HEADSET. COMMUNICATIONS BETWEEN CREW MEMBERS WOULD BE ACOUSTICALLY COUPLED WITH NOISE REDUCTION OCCURRING IN THE DESTINATION HEADSET. UTILIZATION OF A SIMPLE (BUT POWERFUL), SPEECH TRANSPARENT ALGORITHM IS PROPOSED. THE ANTICIPATED HARDWARE SIZE, COST, AND POWER, MADE POSSIBLE BY RECENT STRIDES IN VLSI, WOULD RENDER THE TECHNIQUE APPLICABLE SO A VARIETY OF PROBLEMS, INCLUDING NOISE REDUCTION IN HEAVY VEHICLES AND INDUSTRIAL PLANTS; INTERFERENCE REDUCTION IN RF COMMUNICATIONS; AND S/N ENHANCEMENT FOR SPEECH ENCODERS. THIS EFFORT WOULD ENCOMPASS DEVELOPMENT OF A PRESSTYPE PROCESSOR, WITH EVALUATION TO ASSESS NOISE REDUCTION CAPABILITY AND QUALITY OF PROCESSED SPEECH. OPTIMUM (FIXED) PARAMETERS FOR A FUTURE (PHASE II) ADVANCED DEVELOPMENT MODEL (ADM) WOULD BE DETERMINED DURING THE TESTING.

DYNAMIC ANALYSIS AND TEST ASSOCIATES
211 NORTH EL CAMINO REAL, SUITE 102/B8
ENCINITAS, CA 92024
JOHN F JAKOVICH

NAVY \$ 89,888

TITLE:
DEVELOP THREE DIMENSIONALL FINITE ELEMENT MESH OF SVTT MK32 ROTATING BASE
TOPIC: 69 OFFICE: NSSC

THE FINITE ELEMENT MESH OF THE SURFACE VESSEL TORPEDO TUBE MK32 ROTATING BASE WILL BE DEVELOPED FOR THE ABAQUS ANALYSIS COMPUTER PROGRAM USING SUPERTAB INTERACTIVE FINITE ELEMENT MESH GENERATION PROGRAM. THE MODEL WILL CONSIST OF A COMBINATION OF BEAM, SHELL AND

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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SOLID ELEMENTS WHERE REQUIRED. THE NODE LOCATIONS, MATERIAL PROPERTIES, PHYSICAL PROPERTIES, LOADS, RESTRAINTS AND ELEMENT CARDS WILL BE FORMATTED IN THE FORMAT REQUIRED BY THE ABAQUS ANALYSIS PROGRAM USING THE BULK DATA FILE FORMATTING FEATURE OF SUPERTAB. THE FINAL ABAQUS MODEL CAN BE VERIFIED USING DYNAMIC LOADING INPUTS FROM EXISTING EMPIRICAL TEST DATA.

DYNAMICS TECHNOLOGY, INC. 22939 HAWTHORNE BLVD., SUITE 200 TORRANCE, CA 90505 DUANE T. HOVE TITLE: DEVELOPMENT OF AN OPTICAL DUST PROBE TOPIC: 4	DNA	\$ 72,851
OFFICE: DDST		

IT IS PROPOSED TO DEMONSTRATE THE FEASIBILITY OF, AND ESTABLISH DESIGN CRITERIA FOR, AN OPTICAL PROBE TO MEASURE THE DUST LOFTED BY THE SHOCK WAVE DURING A NUCLEAR BLAST WAVE SIMULATION. DUST DENSITY IS DETERMINED FROM THE REDUCTION IN INTENSITY OF LIGHT PROJECTED OVER AN INTERROGATION PATH TRANSVERSE TO THE FLOW. USE OF A SIMPLE LIGHT SOURCE AND DETECTOR WITH FIBER OPTIC TRANSMISSION LINES PRODUCES AN INEXPENSIVE RUGGED INSTRUMENT WHICH CAN BE DEPLOYED IN MULTIPLE PROBE RAKES. USE OF A DIGITAL DATA ACQUISITION SYSTEM MINIMIZES THE NEED FOR EXPENSIVE TRANSMISSION CABLES AND SIGNAL CONDITIONING ELECTRONICS IN PHASE I, A LIGHT SOURCE AND A DETECTOR WILL BE SELECTED AND CALIBRATED AGAINST KNOWN PARTICLE CONCENTRATIONS AND DISTRIBUTIONS, AND PRELIMINARY DESIGNS WILL BE ESTABLISHED FOR SHOCK TUBE AND FIELD TEST MEASURING STATIONS.

DYNAMICS TECHNOLOGY, INC. 22939 HAWTHORNE BLVE, SUITE 200 TORRANCE, CA 90505 DR C. MICHAEL DUBE TITLE: FIBER OPTIC MAGNETIC GRADIOMETER FOR DETECTING DEEPLY BURIED ORDNANCE TOPIC: 73	NAVY	\$ 75,911
OFFICE: NSSC		

A MAGNETIC GRADIOMETER BASED ON THE PROVEN CONCEPT OF A FIBER OPTIC INTERFEROMETRIC MAGNETIC TRANSDUCER IS PROPOSED FOR THE DETECTION OF DEEPLY BURIED ORDNANCE. THE LOCAL MAGNETIC GRADIENT CAN BE MEASURED WITH HIGH SENSITIVITY WITH A MACH-ZEHNDER OPTICAL INTERFERO-

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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METER; THE TWO SENSING ARMS ARE COMPOSED OF A SINGLE MODE OPTICAL FIBER COATED WITH, OR OTHERWISE ATTACHED TO, A MAGNETOSTRICTIVE MATERIAL. A FIBER OPTIC SENSOR OFFERS UNIQUE ADVANTAGES OVER OTHER SENSORS IN SENSITIVITY, LOW POWER CONSUMPTION, LOW MAGNETIC SIGNATURE AND PORTABILITY. DURING PHASE I, DYNAMICS TECHNOLOGY WILL CALCULATE THE PRINCIPAL PERFORMANCE REQUIREMENTS AND ANTICIPATED NOISE LEVELS FOR A FIBER GRADIOMETER USING OUR EXISTING MAGNETIC FIELD SIGNATURE MODELS, AND WILL TEST THE MOST PROMISING CANDIDATE CONFIGURATIONS IN OUR OPTICS LABORATORY USING CONTROLLED MAGNETIC FIELD SOURCES. SENSITIVITY MEASUREMENTS WILL BE MADE FROM WHICH EXTRAPOLATIONS TO A PROTOTYPE SENSOR PERFORMANCE CAN BE CALCULATED. A PRELIMINARY DESIGN FOR A PHASE II PROTOTYPE SENSOR WILL BE DEVELOPED.

E-OIR MEASUREMENTS, INC. P.O. BOX 3348 FREDERICKSBURG, VA 22402 JOSEPH R. MOULTON TITLE: THERMAL TARGET PROJECTOR FOR COMBAT VEHICLE RECOGNITION TRAINING OF THERMAL NIGHT SIGHT OPERATORS TOPIC: 5e	ARMY	\$ 81,811
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THIS PHASE I CALLS FOR THE DEVELOPMENT OF A PROOF-OF-CONCEPT THERMAL TARGET PROJECTOR DEMONSTRATOR FOR TRAINING THERMAL IMAGER OPERATORS IN THE FIELD OR MOTOR POOL AREAS FOR PROFICIENCY IN RECOGNITION OF NATO AND WARSAW PACT COMBAT VEHICLES. THE TTP AS PROPOSED IS A LOW-COST ^STRAP ON DEVICE ON THE FRONT LENS OF FIELDLED THERMAL NIGHT SIGHTS THAT ARE VEHICLE OR TRIPOD MOUNTED. UPON COMMAND THE TTP PROJECTS HIGH-FIDELITY THERMAL SCENES OF COMBAT VEHICLES IMMERSED IN EUROPEAN OR MIDDLE EAST BACK GROUNDS AT A VARIETY OF TACTICAL RANGES. THE THERMAL SLIDES CAN BE ANNOTATED WITH TEXT TO PROVIDE SELF-STUDY OF THERMAL PROMINENCES THAT CUE THE OPERATOR FOR RECOGNITION AND IDENTIFICATION OF THE COMBAT VEHICLE IN VIEW. THE PROGRAM PROVIDES FOR THE DEVELOPMENT OF AN OPTIMUM PHOTO-SENSITIZING PROCESS FOR INFRARED TRANSMISSION SUBSTRATES FOR USE IN FABRICATING THERMAL SLIDES. TECHNIQUES WILL BE DEVELOPED THAT PERMIT THE IMBEDDING OF COMBAT VEHICLE IMAGES INTO STANDARD TERRAIN SCENES. THE PROGRAM PROVIDES FOR INPUTS FROM TRADOC TO INSURE THE FUNCTIONAL CAPABILITY SATISFIES THE THERMAL TRAINING REQUIREMENTS OF THE USER. IN ADDITION, THE PROGRAM PROVIDES FOR DEMONSTRATION OF THE UNIT AT THE ARMOR SCHOOL AT FORT KNOX AND THE INFANTRY SCHOOL SCHOOL AT FORT BENNING IN ORDER TO

FISCAL YEAR 1983

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OBTAIN MEANINGFUL ASSESSMENT DATA FOR THE FINAL REPORT AND PHASE II CONSIDERATIONS.

E-TEK DYNAMICS INC./LASER OPTICS RES P.O. BOX 1003 MELBOURNE, FL 32901 J.J. PAN TITLE: MILLIMETER-WAVE TECHNOLOGY TOPIC: 86	NAVY	\$ 43,187
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OFFICE: NESY

THE OBJECTIVE OF PHASE I STUDY IS TO CONDUCT A MILLIMETER-WAVE (MMW) SYSTEM SURVEY (INCLUDING SATCOM, RADAR, SECURITY COMMUNICATIONS, RADIOMETER, SEEKER, DESIGNATOR, SPACE COMM. AND ECM SYSTEMS) TO IDENTIFY SEMICONDUCTOR DEVICES/COMPONENTS REQUIREMENTS, CRITICAL PROBLEMS AND SYSTEM SPECIFICATIONS. KEY MMW TECHNOLOGIES SUCH AS PHASED/ADAPTIVE ARRAY, ACTIVE ARRAY, FAST-HOPPING FREQUENCY SYNTHESIZER, ARE IMPORTANT FOR THE FUTURE NAVAL EHF SYSTEMS, AND WILL BE INVESTIGATED AND FORCASTED. SI, GAAS, INP AND OTHER III-V MATERIALS, DEVICES, AND MONOLITHIC IC'S ARE CONSIDERED FOR LOW NOISE AND POWER APPLICATIONS. EXOTIC DEVICES SUCH AS PERMEABLE BASE TRANSISTOR AND VERTICAL MESFET MAY PROVIDE HIGH POWER, HIGH FREQUENCY POTENTIALS. NEW POWER COMBINING TECHNIQUE USING AN ACTIVE ANTENNA REFLECTOR MAY RESULT IN HIGH POWER AND HIGH EFFICIENCY MMW SYSTEMS APPLICATIONS, TECHNOLOGY TRENDS, THE FUTURE R&D NEEDS/PRIORITY AND R&D TOPICS/TASK/COST WILL BE DISCUSSED AND RECOMMENDED AS A RESULT OF THIS SURVEY.

ECON, INC. 4020 MOORPARK AVENUE, SUITE 216 SAN JOSE, CA 95117 JOHN P. SKRATT TITLE: A STUDY OF POLICY ISSUES OF THE TRANSITION FROM STRATEGIC DETERRENCE TO STRATEGIC DEFENSE TOPIC: 10	DNA	\$108,762
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OFFICE: DDST

THE ADVANCE OF TECHNOLOGIES MAY MAKE DEFENSE AGAINST BALLISTIC MISSILES TECHNICALLY AND ECONOMICALLY FEASIBLE. A NATIONAL POLICY DEBATE HAS BEGUN ON THE DESIRABILITY OF MAKING A TRANSITION FROM STRATEGIC DETERRENCE TO STRATEGIC DEFENSE. THE DEBATE IS AT PRESENT

FISCAL YEAR 1983

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HIGHLY CONFUSING AND UNSTRUCTURED, SINCE THE VARIOUS ARGUMENTS FOR AND AGAINST THAT TRANSITION ARE BASED ON DIFFERING ASSUMPTIONS, OFTEN TACIT, ABOUT TECHNOLOGICAL CAPABILITIES MILITARY DOCTRINES, ARMS CONTROL AGREEMENTS AND NATIONAL INTENTIONS OF THE NUCLEAR POWERS. THE OBJECTIVE OF THIS PROJECT IS TO AID IN CLARIFYING THAT DEBATE BY:

(1) COMPILING A WIDE SPECTRUM OF ARGUMENTS ABOUT STRATEGIC DEFENSES; (2) IDENTIFYING THE UNDERLYING ASSUMPTIONS ON WHICH THOSE ARGUMENTS ARE BASED BY DRAWING ON AN HISTORICAL ANALYSIS OF KEY FACTORS IN PAST POLICY DECISIONS; (3) ANALYZING WHETHER AND HOW THE UNDERLYING ASSUMPTIONS COULD BE VALIDATED OR REFUTED; AND (4) DEVELOPING A VARIETY OF SCENARIOS, EACH BASED ON A SET OF MUTUALLY CONSISTENT ASSUMPTIONS DESCRIBING; (a) THE NATURE OF INTERNATIONAL CONFLICT UNDER A SYSTEM OF STRATEGIC DEFENSE.

EDDINS-EARLES	AF	\$ 24,835
89 LEE DRIVE		
CONCORD, MA 01742		
MARY EDDINS EARLES		
TITLE:		
DEVELOPMENT OF A SOFTWARE COST ESTIMATION MODEL FOR THE		
CONCEPTUALIZATION/FORMULATION STAGES		
TOPIC: 9b	OFFICE: RADC	

THIS RESEARCH PROPOSES TO CONCEPTUALLY DESIGN A PARAMETRIC MODEL AND AN ASSOCIATED INTERACTIVE COMPUTER PROGRAM THAT WILL ACCURATELY ESTIMATE THE COST OF SOFTWARE IN COMPUTERS EMBEDDED IN AIR FORCE C3 I SYSTEMS. THE MODEL WILL BE BASED ON THE RELATIONSHIPS BETWEEN COST, THE NUMBER OF EXECUTABLE SOURCE LINES OF CODE, AND PERMISSIBLE DEVELOPMENT TIME. THE REQUIREMENTS AND LOGIC FOR THE DEVELOPMENT OF A DATA BASE FOR THE COMPARATIVE ESTIMATING OF REQUIRED SOFTWARE FUNCTION LEVEL SIZING IN PUTS WILL ALSO BE FORMULATED. BOTH DESIGNS WILL BE INTEGRATED INTO THE STRUCTURE OF A USER FRIENDLY INTERACTIVE COMPUTER PROGRAM THAT THE ANALYST CAN USE FOR MUCH MORE ACCURATE CONCEPTUALIZATION/FORMULATION STAGE SOFTWARE COST ESTIMATES.

EIC LABORATORIES, INC.	AF	\$ 54,555
111 DOWNEY STREET		
NORWOOD, MA 02062		
K. M. ABRAHAM		
TITLE:		
A VERY HIGH ENERGY DENSITY AMBIENT TEMPERATURE SECONDARY LITHIUM		
BATTERY		
TOPIC: 13a	OFFICE: AFWAL/XRP-PO	

A FEASIBILITY STUDY OF AN AMBIENT TEMPERATURE RECHARGEABLE LITHIUM BATTERY BASED ON THE Li/a-V2S5 CHEMICAL COUPLE IS PROPOSED. IT IS ENVISIONED THAT THIS BATTERY, WHEN FULLY DEVELOPED, WILL PROVIDE SPECIFIC ENERGIES APPROACHING 300 Whr/Kg AND VOLUMETRIC ENERGY DENSITY

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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TIES EXCEEDING 300 Whr/LITRE. IN THE PHASE I PROGRAM, IT IS PROPOSED TO SYNTHESIZE AND CHARACTERIZE AMORPHOUS VANADIUM PENTASULPHIDE (a-V₂S₅), DETERMINE ITS ELECTRONIC CONDUCTIVITY, CONSTRUCT AND TEST WELL SPECIFIED, 0.70 A-hr CAPACITY, PREPROTOTYPE CELLS. THE ELECTROLYTE WILL BE 2ME-THF/LiAsF₆, THE HIGHEST EFFICIENCY Li CYCLING SOLUTION AVAILABLE. THE CELL TEST WILL CONSIST OF CAPACITY DETERMINATION CORRESPONDING TO CURRENT DENSITIES OF 0.5, 2, 4 AND 8 mA/cm² AS WELL AS LIMITED CELL CYCLING. IT IS INTENDED THAT THE PHASE I PROGRAM WILL ESTABLISH A STRONG FOUNDATION FOR A PHASE II PROGRAM INVOLVING EXTENSIVE BATTERY DEVELOPMENT. THE LATTER WILL INCLUDE PROTOTYPE BATTERY FABRICATION.

EIC LABORATORIES, INC 111 CHAPEL STREET NEWTON, MA 02158 R DAVID RAUH TITLE: SCHOTTKY BARRIER PHOTOELECTRODES WITH A VARIABLE BARRIER HEIGHT TOPIC: 122	NAVY	\$ 50,510
OFFICE: NAV RESEARCH		

THE OBJECTIVE OF THIS RESEARCH IS TO INVESTIGATE THE PROPERTIES OF SCHOTTKY BARRIERS FORMED BETWEEN SEMICONDUCTORS AND ION INSERTION COMPOUNDS HAVING CONTINUOUSLY VARIABLE STOICHIOMETRIES AND WORK FUNCTIONS. IN PHASE I, THE DIODE p-Si/M_xWO₃ (M = H, LI, 0 < x < 1) WILL BE STUDIED, SINCE THE REACTION M_x-AWO₃ AM⁺ + Ae⁻ COVERS THE FULL RANGE OF POTENTIALS REPRESENTED BY THE p-Si BAND GAP. IN PARTICULAR, CONCEPTS OF FERMI LEVEL PINNING WILL BE TESTED. M_xWO₃ COMPOSITIONS WITH LOW WORK FUNCTIONS (HIGH X) WILL BE USED TO MAXIMIZE THE DIODE BARRIER HEIGHTS. THESE, IN TURN, WILL BE USED IN PHOTO-ELECTRO-CHEMICAL CELLS AND AS SOLID STATE DIODES TO PRODUCE PHOTOVOLTAIC CONVERTERS OF HIGH PHOTOVOLTAGE AND ENERGY CONVERSION EFFICIENCY.

ELECTROCON INTERNATIONAL, INC. 611 CHURCH STREET ANN ARBOR, MI 48104 DR. DONALD M. MACGREGOR TITLE: ELECTROMAGNETIC FIELD THEORY OF METAL CERAMIC HELICES TOPIC: 12b	AF	\$ 45,049
OFFICE: AFWAL/XRPA		

A VARIATIONAL TECHNIQUE WILL BE USED TO COMPUTE THE ELECTROMAGNETIC FIELDS OF TRAVELING WAVES IN A HELICAL SLOW-WAVE CIRCUIT WITH HELICAL DIELECTRIC SUPPORT. BY GENERALIZING THE TRIAL FIELDS FROM THOSE USED IN AN EARLIER STUDY AND BY APPLYING POINT-MATCHING CONSTRAINTS, AN

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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EFFICIENT COMPUTATION WILL BE DEVELOPED FOR THE PHASE VELOCITY, INTERACTION IMPEDANCE, AND CHARACTERISTIC IMPEDANCE OVER A CHOSEN FREQUENCY BAND. THE THEORY WILL BE VERIFIED USING RESULTS FROM PREVIOUS COLD TEST MEASUREMENTS.

ELECTROMAGNETIC SCIENCES, INC. 125 TECHNOLOGY PARK/ATLANTA NORCROSS, GA 30092 GORDON R. HARRISON TITLE: NEAR-MILLIMETER WAVE FERRITE MATERIALS AND COMPONENTS RESEARCH TOPIC: 9p	ARMY	\$103,903
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OFFICE: DRDELERADCOM

HIGHLY ANISOTROPIC ALIGNED UNIAXIAL POLYCRYSTALLINE HEXAGONAL FERRITE COMPOUNDS POSSESS BUILT-IN EFFECTIVE MAGNETIC FIELDS . THESE MATERIALS POSSESS ATTRACTIVE MICROWAVE AND MAGNETIC PROPERTIES OF POTENTIAL IMPORTANCE TO ACHIEVE IMPROVED PERFORMANCE IN AND INNOVATIVE STRUCTURES FOR NONRECIPROCAL CIRCUIT FUNCTIONS AT NEAR-MILLIMETER WAVE FREQUENCIES.

INVESTIGATIONS WILL BE CONDUCTED FOR THE EVALUATION OF THESE MATERIALS IN A RESONANCE ISOLATOR WAVEGUIDE STRUCTURE, A WAVEGUIDE Y-JUNCTION CIRCULATOR, AND A PHASE SHIFT TYPE FOUR-PORT WAVEGUIDE DUPLEXER. THE FREQUENCY OF EVALUATION WILL BE AT 94 GHz PERFORMANCE ACHIEVED WILL BE COMPARED TO THAT PROVIDED FROM CONVENTIONAL SPINEL FERRITES.

THE RESULTS OF THESE PERFORMANCE EVALUATION STUDIES WILL BE USED TO ASSESS AND PREDICT PERFORMANCE AT HIGHER FREQUENCIES, TO PROVIDE INFORMATION ON THE LEVEL AND MAGNITUDE OF THE RF-FERRITE INTERACTION PARAMETERS WHICH CAN BE USED TO CONCEIVE AND PREDICT PERFORMANCE IN MORE INNOVATIVE STRUCTURES AND TO ASSIST IN IDENTIFYING AND ADDRESSING CRITICAL MATERIAL PROBLEMS, LIMITATIONS AND OPPORTUNITIES.

ELECTRONIC DESIGN AND RESEARCH CO., INC. 770 MEDICAL TOWERS S. LOUISVILLE, KY 40202 VLADIMIR SHVARTSMAN TITLE: THE MULTICHANNEL SIGNAL PROCESSING TECHNIQUE BASED ON LOGICAL CLEANSING TOPIC: 6h	ARMY	\$ 49,637
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OFFICE: SGRD-MRDC

A NEW TYPE NOISE REDUCTION TECHNIQUE (1) HAS OPENED THE OPPORTUNITY TO DETECT BOTH A SIGNAL WITH NEGATIVE SIGNAL TO NOISE RATIO AND RANDOM SIGNAL ON A LINE. THE IMPORTANT ADVANTAGE OF THIS TECHNIQUE OVER ANY LINEAR PROCESSING IS A SUPPRESSION OF AN EXTERNAL ENVIRONMENT

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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<p>NOISE AS WELL AS AN INTERNAL BACKGROUND NOISE. IT PROVIDES A REAL TIME DETECTION AT A WIDE FREQUENCY RANGE. THIS VERY EFFICIENT AND INEXPENSIVE APPROACH TO IMPROVE THE SNR BY THEMULTICHANNEL SIGNAL PROCESSOR REDUCES THE NEED FOR OTHER SIGNAL PROCESSING TECHNIQUES. THE ATTACHED ARTICAL OF THE MCSP SHOWS THE BLOCK DIAGRAM, PRINCIPLE, AND PERFORMANCE OF THE DETECTION OF AN INPUT SIGNAL WHEN ITS AMPLITUDE IS LESS THAN THE MAXIMUM AMPLITUDE OF NOISE. THE MCSP DESIGN DEVELOPED HEREIN RESULTS IN INCREASING PROBABILITY OF DETECTION OF A SIGNAL BY PASSING A SIGNAL THROUGH A "LOGICAL CLEANSING". THE "LOGICAL CLEANSING" IS A NEW METHOD WHICH LEADS TO REDUCTION OF RANDOM NOISE BY COMPARING RELATION OF A DEFLECTION ON SEVERAL PARALLEL CHANNELS THROUGH TIME THE USE OF A SPECIAL ALGORITHM.</p>		

ENERGY & MINERALS RESEARCH COMPANY	NAVY	\$ 49,684
964 E. SWEDESFORD ROAD PO BOX 389		
EXTON, PA 19341		
SCOTT R TAYLOR		
TITLE:		
FIELD REPAIR OF LAMINATED COMPOSITIES USING ULTRASONIC METHODS		
TOPIC: 103	OFFICE: NASC	

LAMINATED COMPOSITES ARE BEING INCREASINGLY USED IN AEROSPCE/ MILITARY APPLICATIONS FOR THEIR HIGH STRENGTH-TO-DENSITY AND STIFFNESS-TO-DENSITY RATIOS. THESE COMPOSITES WILL BE SUBJECT TO DAMAGE AND ENVIRONMENTALLY AGED IN USE. REPAIR OF LAMINATED COMPOSITES BY RESIN INJECTION IS HINDERED BY THE DIFFICULTY OF FLOWING RESIN INTO THE DELAMINATION. PREVIOUS WORK HAS SHOWN THE EFFICACY OF ULTRASONIC FLOW PROMOTION IN A WIDE VARIETY OF SYSEMS, INCLUDING THERMOPLASTIC MATERIALS AND VARIOUS RESIN SYSTEMS. THE ULTRASONIC EFFECT IS THAT OF FRICTION REDUCTION BETWEEN THE FLOWING MATERIAL AND THE ADJACENT SURFACE, AS WELL AS TRANSIENTLY REDUCED VISCOSITY AND SURFCE TENSION OF THE FLUID MATERIAL. THE PHASE I OBJECTIVE OF THIS PROPOSED WORK IS TO DEMONSTRATE THE FEASIBILITY OF APPLYING ULTRASONIC FLOW PROMOTION TO IMPROVE RESIN INJECTION INTO DELAMINATIONS IN DAMAGED COMPOSITES, AS DEMONSTRATED BY FLOW MEASUREMENT DURING ULTRASONIC ACTIVATION TO PRELIMINARILY ESTABLISH ULTRASONIC OPERATING PARAMETERS, FOLLOWED BY REPAIR OF DAMAGED COMPOSITE PANELS SUPPLIED BY THE NAVY. THE PANEL

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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SAMPLES WILL BE DELIVERED TO THE NAVY FOR EVALUATION.

ENERGY COMPRESSION RESEARCH	AF	\$ 68,393
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2043 DE MAYO ROAD

DEL MAR, CA 92014

OVED S.F. ZUCKER

TITLE:

DEVELOPMENT OF A SELF-CONTAINED INDUCTIVE STORAGE AND TRANSFER
SYSTEM FOR IMPLoding PLASMA EXPERIMENTS

TOPIC: 8 OFFICE: AWFL/NTYP

IMPLoding PLASMA EXPERIMENTS SUCH AS SHIVA ARE TYPICALLY ENERGIZED WITH LARGE AND EXPENSIVE CAPACITOR BANKS. INDUCTIVE STORAGE WHILE SUBSTANTIALLY MORE COMPACT SUFFERS FROM SWITCH EFFICIENCY AND CURRENT MULTIPLICATION CIRCUITRY PROBLEMS (SEE REF 1). THE MEAT GRINDER IS A GENERIC CIRCUIT INVENTED BY THE PRINCIPLE INVESTIGATOR THAT TRANSFERS CURRENT FROM ONE INDUCTOR TO ANOTHER REVERSIBLY WITHOUT THE CONVENTIONAL SWITCH OR EFFICIENCY PROBLEM AND WITHOUT THE CONVENTIONAL PROBLEMS ASSOCIATED WITH THE CURRENT MULTIPLICATION CIRCUITRY. A PARTICULAR EMBODIMENT FOR IMPLoding PLASMAS UTILIZES ORTHOGONAL FIELD ROTATION TO ALLOW THE STORAGE AND LOAD INDUCTOR TO BE SPATIALLY CONCURRENT. THE RESULTING CIRCUITRY LENDS ITSELF ESPECIALLY WELL TO OVERALL COMPACTNESS OF THE TOTAL POWER TRAIN. BEYOND MILITARY APPLICATIONS, THE DEVELOPMENT OF AN INDUCTIVE PULSED POWER SOURCE IN THE SEC RANGE HAS BROAD IMPLICATIONS IN ALL AREAS OF PLASMA RESEARCH.

ENERGY COMPRESSION RESEARCH CORP.	ARMY	\$ 78,329
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2043 DE MAYO ROAD

DEL MAR, CA 92014

OVED S. F. ZUCKER

TITLE:

DEVELOPMENT OF REVERSIBLE INDUCTIVE STORAGE AND
TRANSFER SYSTEM FOR EM GUNS

TOPIC: 3a OFFICE: DRDAR-RDR

ELECTROMAGNETIC GUNS, IN COMMON WITH MANY OTHER DoD APPLICATIONS, ARE IN NEED OF METHODS FOR TRANSFERRING ENERGY FROM AN INDUCTIVE ENERGY RESERVIOR TO AN INDUCTIVE LOAD, I.E., THE ELECTROMAGNETIC GUN. SUCH A DEVICE NAMED THE "MEAT GRINDER" (PATENT APPLIED FOR) HAS BEEN CON-

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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CEIVED, ANALYZED, AND SUBJECTED TO A FUNDAMENTAL PROOF OF PRINCIPLE EXPERIMENT. THE DEVICE IS CLASSIFIED AS A GENERIC CIRCUIT FOR REVERSIBLE ENERGY TRANSFER BETWEEN INDUCTORS AND WAS IDENTIFIED BY THE LAST EM GUN CONFERENCE REVIEW COMMITTEE AS THE MOST INNOVATIVE CONCEPT PRESENTED (SEE ENCLOSURE). BY PROVIDING FOR REVERSIBILITY, THE "MEAT GRINDER" ALLOWS US TO BENEFIT FROM THE COMPACTNESS AND LOW COST OF INDUCTIVE STORAGE WITHOUT THE INEFFICIENCY AND SWITCH PROBLEM NORMALLY ENCOUNTERED. THE DEVICE UTILIZES A FLUX AND ENERGY INVARIANT TURN-WIPING SCHEME, WHICH DOES IN EFFECT SPREAD THE SWITCHING ACTION IN TIME, THEREBY PROVIDING FOR CONTINUITY, AND THUS REVERSIBILITY, THROUGHOUT THE ENERGY TRANSFER PROCESS.

ENERGY INNOVATIONS, INC.
320 SOUTH HARRISON STREET
EAST ORANGE, NJ 07018
MEREDITH C. GOURDINE

ARMY \$ 23,100

TITLE:

ELECTROGAS DYNAMIC TURBULENT POWER CHARGING
TOPIC: 4d OFFICE: DRDAR

THE ARMY HAS A NEED TO PLACE A SPECIFIC AMOUNT OF ELECTRICAL CHARGE ON POWDER PARTICLES USED TO GENERATE BATTLEFIELD SMOKE. CONVENTIONAL METHODS OF DOING THIS TASK ARE EACH NARROWLY LIMITED TO APPLYING CHARGE OF A PARTICULAR POLARITY TO PARTICLES HAVING PARTICULAR PHYSICAL CHEMICAL COMPOSITIONS. THE TURBULENT ELECTROGASDYNAMIC METHOD DOES NOT HAVE THESE LIMITATIONS, AND IT IS AS CONVENIENT AND PRACTICAL TO USE AS IT IS VERSATILE. THIS METHOD INVOLVES TURBULENT MIXING OF A STREAM OF POWDER IN AIR WITH A SUPERSONIC STREAM OF AIR CONTAINING SUBMICRON SIZE DROPLETS OF WATER CHARGED EITHER POSITIVELY OR NEGATIVELY. TURBULENCE CAUSES THESE CHARGED AEROSOLS TO ATTACH TO THE PARTICLES, REGARDLESS OF THEIR SIZE, PHYSICAL, OR CHEMICAL CHARACTERISTICS. PHASE I RESEARCH WILL BE A THEORETICAL AND EXPERIMENTAL EFFORT DESIGNED TO SHOW THE FEASIBILITY OF THIS APPROACH. A COMMERCIALY AVAILABLE EGD POWDER SPRAY GUN WILL BE USED TO STUDY A PROCESS; SO, THE ARMY WILL HAVE PRACTICAL EQUIPMENT ONCE THE METHOD IS PROVEN VIABLE.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
ENERGY MATERIALS TESTING LAB, INC BIDDEFORD INDUSTRIAL PARK BIDDEORD, ME 04005 DR H. D BATHA TITLE: DETERMINATION OF HIGH TEMPERATURE STRENGTH OF ROCKET MOTOR CASE MATERIALS TOPIC: 37	NAVY	\$ 49,863
OFFICE: NSSC		

THIS PROJECT WILL DEVELOP A TEST PROCEDURE TO DETERMINE STRENGTH OF ROCKET MOTOR CASE MATERIALS AT TEMPERATURES APPROACHING THE MELTING POINT OF THE MATERIALS TO EXTEND THE DATA PRESENTED IN MIL-HDBK-5C. LASER TECHNIQUES TO MEASURE STRAIN BY OBSERVING FLAGS ON THE TEST SPECIMENS AT ELEVATED TEMPERATURES WILL BE USED. SPECIAL ATTENTION WILL BE PAID TO METHODS OF AFFIXING OR CREATING OBSERVATION FLAGS. AN ALUMINUM AND AN IRON ALLOY WILL BE TESTED WITH THE DEVELOPED SYSTEM.

ENERGY SCIENCE LABORATORIES, INC. 11404 SORRENTO VALLEY ROAD, SUITE 113 SAN DIEGO, CA 92121 G.W. WEBB, T.R. KNOWLES TITLE: METAL/PHASE CHANGE MATERIAL COMPOSITE HEAT SINKS TOPIC: 10b	AF	\$ 49,144
OFFICE: AFWAL/XRPF		

THERMAL HEAL LOADS ON SPACECRAFT ARE VARIABLE. RADIATORS SIZED FOR PEA\ LOADS ARE LARGER THAN NECESSARY FOR THE AVERAGE LOAD. HEAT SINKS WOULD ALLOW THE RADIATORS TO BE SIZED FOR THE AVERAGE THERMAL HEAT LOAD. METAL HEAT SINKS ARE TOO HEAVY AND PHASE CHANGE MATERIALS HAVE TOO SLOW A TEMPORAL RESPONSE FOR MANY APPLICATIONS. METAL/PHASE CHANGE MATERIAL COMPOSITES ARE LIGHT WEIGHT AND HAVE A FASTER RESPONSE THAN EITHER COMPONENT. WE DESCRIBE A THREE PART PROGRAM TO ANALYTICALLY MODEL COMPOSITES, EVALUATE AND TEST MATERIALS, AND TO CONSTRUCT A BENCH TOP COMPOSITE HEAT SINK.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
ENGINEERING ANALYSIS, INCORPORATED 2109 CLINTON AVENUE W., SUITE 432 HUNTSVILLE, AL 35805 FRANK B. TATOM TITLE: AUDIO-VISUAL INITIAL DEBUG (AVID) METHOD FOR COMPUTER SOFTWARE TOPIC: 8a OFFICE: BMD	ARMY	\$ 49,615

THE AUDIO-VISUAL INITIAL DEBUG (AVID) METHOD IS PROPOSED AS A FIRST-LINE SOFTWARE DEVELOPMENT TOOL FOR LOCATING ERRORS IN NEW SOURCE CODE. THE CONCEPT INVOLVES USING A COMPUTER SPEECH SYNTHESIZER CONNECTED TO THE TERMINAL TO PROVIDE AN AUDIO PLAY-BACK OF THE SOURCE CODE WHILE THE PROGRAMMER VISUALLY FOLLOWS HIS ORIGINAL HAND-WRITTEN TEXT. AVID AS CURRENTLY ENVISIONED IS SPECIFICALLY DESIGNED TO ANALYZE AND SPEAK FORTRAN SOURCE CODE BUT A DIFFERENT VERSION CAN BE BUILT FOR ANY COMPUTER LANGUAGE. CERTAIN STANDARD AND USER-DEFINED KEY WORDS ARE PRONOUNCED WHILE ALL OTHER SYMBOLS ARE SPELLED CHARACTER BY CHARACTER. SPEECH IS ACCOMPLISHED VIA INEXPENSIVE, PHONEME-BASED, ADD-ON EQUIPMENT WITH ESSENTIALLY UNLIMITED VOCABULARY. SPEAKING RATE, VOLUME, FREQUENCY, AND INTONATION ARE USER-CONTROLLED. IN ADDITION THE AVID SOFTWARE ALLOWS THE USER TO POSITION CONTROL AT ANY LINE IN HIS TEXT AND MOVE IN ANY DIRECTION. IN CONJUNCTION WITH THE AVID SOFTWARE DEVELOPMENT, AN IN-DEPTH SURVEY OF EXISTING SPEECH SYNTHESIS TECHNOLOGY AND EQUIPMENT WILL BE COMPLETED; A DEMONSTRATION OF AVID'S CAPABILITIES WILL BE MADE AVAILABLE; AND RECOMMENDATIONS FOR PHASE II DEVELOPMENT AND ENHANCEMENTS WILL BE COMPILED.

ENGINEERING AND ECONOMICS RESEARCH, INC. 3322 S. MEMORIAL PKWY, SUITE 71 HUNTSVILLE, AL 35801 STEVEN C WALKR TITLE: BALLISTIC MISSILE DEFENSE ADVANCED TECHNOOGY CENTER (BMDATC) TECHNOLOGY BASE MANAGEMENT INFORMATION SYSTEM TOPIC: 8C OFFICE: BMD	ARMY	\$ 48,529
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EER PROPOSES TO CONDUCT A 4 1/2 MAN MONTH EXPLORATORY DEVELOPMENT EFFORT WHICH WILL FOCUS UPON THE FEASIBILITY OF ADAPTING A PRE-VIOUSLY DEVELOPED MANAGEMENT TOOL WHICH IS CAPABLE OF IDENTIFYING BOTH HIERARCHIAL AND RELATIONAL DATA BASE ATTRIBUTES. SPECIFICALLY,

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>EER PROPOSES TO ADAPT A REQUIREMENTS DATA BASE TOOL THAT IS CAPABLE OF BEING IDENTIFIED IN TERMS OF A MAJOR SYSTEM CONSTRUCTOR IN TERMS OF WRITTEN REQUIREMENTS, OR GENERIC WBS. EER THEN PROPOSES TO RELATE THE REQUIREMENTS DATA BASE TO THE ACTUAL TECHNOLOGY ADVANCEMENT EFFORTS UNDERWAY WITHIN THE VARIOUS DIVISIONS OF BMDATC. THE SECOND TASK WILL BE ACCOMPLISHED BY ESTABLISHING A RECOMMENDATIONS DATA BASE IN TERMS OF THE TECHNOLOGY EFFORTS BEING CONDUCTED WITHIN EACH BMDATC DIRECTORATE AS PROPOSED IN THE CURRENT YEAR AS WELL AS THE FIVE YEAR PLAN. THE FEASIBILITY OF ADAPTING THIS PREVIOUSLY ESTABLISHED CAPABILITY RESTS PRIMARILY ON EER'S ABILITY TO IDENTIFY LOOSE LINKAGES IN TERMS OF THE REQUIREMENTS STATED IN THE FIRST DATA BASE VIS-A-VIS THE RECOMMENDATION DEVELOPED IN CURRENT PLANNING EFFORTS WHICH WILL BE CONTAINED IN THE SECOND BASE ONCE THE LINKAGES ARE IDENTIFIED IN TERMS OF SEVERAL OPERATIVE ATTRIBUTES.</p>		

ENGINEERING DYNAMICS INC 1042 CENTRAL PARKWAY SOUTH SAN ANTONIO, TX 78232 FRED R SZENASI TITLE: LANDING GEAR LOAD MONITORING SYSTEM TOPIC: 102 OFFICE: NASC	NAVY	\$ 49,711
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THIS PROPOSAL DESCRIBES PROCEDURES FOR MEASUREMENT OF ACTUAL LOADS DURING FLIGHT OPERATIONS OF NAVY AIRCRAFT BY ATTACHING TRANSDUCERS TO SENSITIVE COMPONENTS OF THE NOSE AND MAIN LANDING GEAR. STRAIN GAGES ARE THE ANTICIPATED TRANSDUCERS; HOWEVER, INDUCTIVE, CAPACITIVE AND OTHER RESISTIVE TRANSDUCERS SHALL BE EVALUATED FOR USE IN THIS SYSTEM. PROCEDURES ARE OUTLINED TO DETERMINE THE OPTIMUM LOCATIONS FOR TRANSDUCERS BY EVALUATING THE DESIGN STRESS ANALYSES AND AIRCRAFT DROP TESTS PERFORMED BY THE MANUFACTURER. AN ELECTRONIC DATA ACQUISITION AND RECORDING SYSTEM SHALL BE DESIGNED TO OBTAIN THESE LOADING SIGNALS. ELECTRONIC COMPONENTS AND TRANSDUCERS SHALL BE CHOSEN WHICH CAN WITHSTAND THE EXTREME ENVIRONMENTAL CONDITIONS IMPOSED ON THE NAVAL AIRCRAFT AND PRODUCE NO UNDESIRABLE EFFECTS ON OTHER AIRCRAFT SYSTEMS. TWO DATA MEASURING AND PROCESSING METHODS ARE PRESENTED WHICH CAN SEPARATE THE LOADING ON THE LANDING GEAR IN TO SEPARATE FORCE COMPONENTS (BENDING, TENSION, AND AXIAL). A FINAL REPORT SHALL BE WRITTEN TO DOCUMENT THE BEST TYPE AND LOCATION OF

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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TRANSDUCERS, DESIGN OF THE MEASUREMENT SYSTEM, SPECIFIC FUNCTIONS OF THE ELECTRONIC COMPONENTS AND FAILURE MODES OF THE SYSTEMS.

ENGINEERING GUILD 12105 W. JEFFERSON BLVD, SUITE 200 CULVER CITY, CA 90230 PAUL GRIFFITH	ARMY	\$ 49,860
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TITLE:

AN ELECTRONIC SYSTEM TROUBLESHOOTING PROGRAM USING ARTIFICIAL INTELLIGENCE TECHNIQUES.

TOPIC: 5b OFFICE: AVSCOM

WE PROPOSE TO STUDY AND CONSTRUCT AN ARTIFICIAL INTELLIGENCE PROGRAM WHICH CAN IDENTIFY ELECTRONIC MANFUNCTIONS, THEN LEARN FROM ITS SUCCESSES AND FAILURES TO BE MORE EFFICIENT, ACCURATE, AND EXPERT. THE PROGRAM WILL DRAW ON A DATABASE OF GENERAL TROUBLESHOOTING TECHNIQUES, SPECIFIC DEVICE KNOWLEDGE, AND EXPERIENCE WITH THE SYSTEM UNDER TEST TO DIRECT A TECHNICIAN'S DEBUGGING ACTIVITIES. THE PROGRAM WILL ASK THE TECHNICIAN FOCUSED QUESTIONS ABOUT THE SYSTEM'S STATUS. THE QUESTIONS WILL REQUIRE PROBING FOR VOLTGES, LOGIC LEVELS, ETC. THE INFORMATION GENERATED WILL LEAD TO MORE QUESTIONS, UTILIMATELY RESULTING IN RECOMMENDATIONS FOR REPAIR. CORRECT ANALYTIC CONCLUSIONS WILL BE INCORPORATED INTO THE PROGRAM'S MEMORY, REDUCING THE TIME TO FIND THE SAME PROBLEM THEREAFTER. TECHNICIANS WILL BE ABLE TO QUESTION WRONG CONCLUSIONS AND TO UNCOVER THE LOGIC LEADING TO THE ERRORS. MALFUNCTIONS LOCATED BY PROGRAM RECOMMENDATIONS OR BY TECHNICIANS HENCE INCREASE THE PROGRAM'S KNOWLEDGE. MISTAKES ALSO LEAD TO NEW KNOWLEDGE AND THE FORMULATION OF NEW PROGRAM RULES WITHIN THE KNOWLEDGE BASE. THE PROGRAM AMPLIFIES AND EXTENDS THE TECHNICIAN'S EXPERTISE. OVERALL, THE PROJECT WILL MODEL AND ELABORATE AI PROGRAMS NOW RUNNING SUCCESSFULLY IN OTHER FIELDS, AND WILL UTILIZE ADA FOR MAXIMUM SYSTEMIC UTILITY.

ENGINEERING INCORPORATED 41 RESEARCH DRIVE, LANGLEY RESEARCH PARK HAMPTON, VA 23666 GEORGE W. BROOKS	ARMY	\$ 49,175
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TITLE:
A COMPACT, SELF-CONTAINED, PNEUMATICALLY DRIVEN SUCTION SYSTEM FOR MEDICAL SUPPORT
TOPIC: 6x OFFICE: SGRD-MRDC

THIS PROPOSAL CONCERNS R&D TO PROVIDE A NON-ELECTRICAL SUCTION DEVICE FOR MEDICAL SUPPORT. THE OBJECTIVE OF THE PROPOSED WORK IS TO DEVELOP A SELF-CONTAINED, LIGHTWEIGHT, PORTABLE PNEUMATICALLY DRIVEN SYSTEM TO PROVIDE SUCTION VARYING FROM 10 TO 100 cm OF WATER. THE CONCEPT PRO-

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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VIDES THE OPTION THE SELF-CONTAINED POWER SYSTEM CAN BE AUGMENTED BY STORED PNEUMATIC ENERGY, SUCH AS A SPARE TIRE, AS AVAILABLE. THE COMPLETE SYSTEM, INCLUDING THE PRESSURE, CONTROL AND SUCTION COMPONENTS, IS INTEGRALLY COUPLED AND PACKAGED IN A "READY FOR USE" MODE. THE PRINCIPAL EFFORT INVOLVES THE DETAIL DESIGN AND PRODUCTION OF THE SYSTEM TO INCORPORATE STATE-OF-THE-ART MATERIALS AND COMPONENTS AS REQUIRED TO MAKE THE SYSTEM FUNCTIONAL, RELIABLE AND SIMPLE. THE GOAL IS TO PRODUCE A PRELIMINARY DESIGN OF THE SYSTEM, INCLUDING TRADEOFFS TO SELECT OPERATIONAL PARAMETERS, MATERIALS AND CONTROLS IN PHASE I.

ENVIRONMENTAL ENERGY SYSTEMS, INC. 218 NORTH LEE STREET ALEXANDRIA, VA 22314 RONALD D. BISHOP TITLE: ARTIFICIAL INTELLIGENCE/ROBOTIC SUPPLEMENT TO MEDICAL SUPPORT TOPIC: 5L	ARMY	\$ 98,986
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ENVIRONMENTAL ENERGY SYSTEMS, INC. (EES) PROPOSES A FEASIBILITY STUDY TO BE MADE OF AN ADVANCED ROBOTIC VEHICLE CAPABLE OF ENTERING A BATTLEFIELD, LOCATING AND RETRIEVING CASUALTIES, AND RETURNING THEM TO THE REAR FOR TREATMENT. THE ROBOTIC VEHICLE ALSO MIGHT CONDUCT LIMITED DIAGNOSTIC OR TREATMENT FUNCTIONS. ARTIFICIAL INTELLIGENCE PROGRAMMING AND ADVANCED ROBOTIC SENSOR AND COMPUTER TECHNOLOGIES WILL BE KEY TO THE VEHICLE'S CAPABILITIES. THE GENERAL CONCEPT FOR THE ARTIFICIAL INTELLIGENCE/ROBOT SUPPLEMENT TO MEDICAL SUPPORT CALLS FOR A SMALL, LIGHT-WEIGHT, TWO-UNIT WHEELED VEHICLE USING A TWIN HULL CONSTRUCTION WITH A CONNECTING, FULL ARTICULATED PIVOT. IT WOULD BE OF LOW PROFILE AND NARROW WIDTH YET STILL BE CAPABLE OF CARRYING TWO SOLDIERS IN A PRONE POSITION. THE VEHICLE WOULD BE MONITORED AND DIRECTED FROM A CONTROL VAN TO THE REAR. ON BOARD, SENSORS, COMMUNICATIONS, AND ACTUATING DEVICES WOULD BE EMPLOYED UNDER ARTIFICIAL INTELLIGENCE PROGRAMMING TO LOCATE AND RETRIEVE CASUALTIES. IT APPEARS FEASIBLE FOR SUCH A VEHICLE TO PERFORM THESE FUNCTIONS AND POSSIBLE DIAGNOSTIC AND TREATMENT ACTIVITIES AS WELL. PROJECT OBJECTIVES WILL BE TO DETERMINE THE FEASIBILITY OF SUCH A VEHICLE AND DEVELOP THE BASELINE DESIGN DATA FOR PROTOTYPING OF THE CONCEPT IN LATER PHASES. EES IS UNIQUELY

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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QUALIFIED TOPERFORM THISRESEARCH DUE TO ITS BACKGROUND IN ROBOTIC VEHICLES, TELEMETRY AND SENSOR DESIGN, AND IN ARTIFICIAL INTELLIGENCE CONCEPTS. THE EES APPROACH WILL BE TO USE ITS INSTITUTIONAL KNOWLEDGE AND EXPERTISE TO ANALYZE THE REQUIREMENT AND IDENTIFY AND EVALUATE APPROPRIATE TECHNOLOGY FOR THE ROBOTIC VEHICLE. TEAMS WOULD BE ORGANIZED CAPABLE OF THIS LEVEL OF RESEARCH AND EACH WOULD CONTRIBUTE TO THE INTEGRATION OF THEIR DIVERSE TECHNOLOGIES INTO A PRACTICAL SYSTEM CONCEPT. THE RESULTS OF THEIR FINDINGS WOULD BE SUBMITTED TO THE U.S. GOVERNMENT IN THE FORM OF AN INTERIM AND FINAL REPORT.

EPI-TECH CORPORATION 52234 EAST HATCHER ROAD PARADISE VALLEY, AZ 85253 DR. ROBERT L. ADAMS TITLE: GROWTH OF GaAs USING ION CLUSTER BEAM TECHNOLOGY TOPIC: 12a	AF	\$ 50,000
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THIS PROGRAM IS INVESTIGATING THE GROWTH OF GaAs USING IONIZED CLUSTER BEAM (ICB) TECHNOLOGY EMPLOYING SUBSTRATE GROWTH TEMPERATURES OF LESS THAN 6000 C. UNINTENTIONALLY DOPED EPITAXIAL GaAs HAS BEEN GROWN ON WELL CHARACTERIZED SEMI-INSULATING GaAs SUBSTRATES. THE ICB GROWN GaAs IS BEING THOROUGHLY CHARACTERIZED. RECENT WORK HAS BEEN DONE ON THE DEPOSITION OF Si SEMICONDUCTOR FILMS FOR USE IN SOLAR CELL APPLICATIONS. OTHER WORK ON III-V FILMS HAS ALSO BEEN ADDRESSED. THIS TECHNIQUE OPERATES AS A HYBRID APPROACH BETWEEN MBE AND ION IMPLANT. USING VACUUM LEVELS OF 10⁻⁷ TORR AND ACCELERATED IONIZED CLUSTERS, DEPOSITIONS OF SINGLE CRYSTAL FILMS HAVE BEEN DONE AT REDUCED SUBSTRATE TEMPERATURES. THE USE OF THIS PROCESS TO GaAs COULD OFFER AN EPI PROCESS THAT OPERATES AT TEMPERATURES BELOW 500 DEGREE WITH LARGE AREA UNIFORMITY IN THICKNESS AND COMPOSITION.

FIBER MATERIALS, INC. BIDDEFORD INDUSTRIAL PARK BIDDEFORD, ME 04005 JOHN N. PEPIN TITLE: MATERIAL CHARACTERIZATION STUDY OF A GRAPHIC/GELATIN COMPOSITE FOR BONE CEMENT OR BONE REPLACEMENT TOPIC: 6r	ARMY	\$ 49,995
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MANY AREAS OF ORTHOPAEDIC SURGERY WOULD BENEFIT FROM AN INJECTABLE, BIOCOMPATIBLE BONE CEMENT OR BONE REPLACEMENT MATERIAL WHICH COULD PROVIDE IMMEDIATE STRUCTURAL REINFORCEMENT TO SKELETAL REGIONS AND THEN GRADUALLY BE INCORPORATED INTO HOST BONES. THE HARVARD MEDICAL

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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SCHOOL BIOMECHANICS LABORATORY HAS DEVELOPED A PARTICIPATE BONE/GELATIN COMPOSITE WHICH IS CURRENTLY UNDERGOING TESTS IN ANIMALS. THIS COMPOSITE HAS APPEALING QUALITIES IN THAT THE MATRIX PHASE BECOMES SLOWLY RESORBED IN THE BODY AS HOST BONE GROWS INTO THE REPAIR AREA; HOWEVER, ITS MECHANICAL PROPERTIES ARE NOT OPTIMUM AT PRESENT. ITS COMPRESSIVE STRENGTH RANGES FROM 10-15 MPa AND MODULES FROM 50-100 MPa. HIGHER VALUES ARE REQUIRED FOR BOTH CEMENT AND BONE REPLACEMENT APPLICATIONS.

THIS PROPOSED WORK WILL STUDY A CHOPPED GRAPHITE FIBER/GELATIN COMPOSITE AS A CANDIDATE MATERIAL FOR A BONE REPLACEMENT OR BONE CEMENT MATERIALS. A FABRICATION PROCESS WILL BE DEVELOPED TO MAKE COMPOSITES WITH ISOTROPIC PROPERTIES FOR MATERIAL CHARACTERIZATION TESTING. COMPOSITE PROPERTIES WILL BE DETERMINED FROM TENSION, COMPRESSION, AND SHEAR TESTING WHILE THE MICROMECHANICAL BEHAVIOR WILL BE ASSESSED THROUGH SCANNING ELECTRON MICROSCOPE AND METALLOGRAPH EXAMINATIONS. THIS BASIC PROPERTY INFORMATION WILL, FIRST ESTABLISH FEASIBILITY, AND SECOND, PROVIDE GROUND WORK FOR EXPANDED RESEARCH INVOLVING HOST BONE ENCAPSULATION OF FIBERS COMPATABILITY AND OTHER TOPICS.

FIBER MATERIALS, INC.
BIDDEFORD INDUSTRIAL PARK
BIDDEFORD, ME 04005

ARMY \$ 49,924

JOHN W. HERRICK

TITLE:

THE MECHANISM OF SIMULATED TOXIC VAPOR PERMEATION THROUGH
ACTIVATED CARBON FABRICS

TOPIC: 4b OFFICE: DRDHA-WA

FABRICS CONSISTING OF ACTIVATED CARBON FIBERS ARE BEING DEVELOPED FOR USE IN CHEMICAL PROTECTIVE GARMENTS AS A POTENTIAL REPLACEMENT FOR THE CURRENT COATED FOAM. THESE FABRICS NOT ONLY MUST ABSORB TOXIC CHEMICAL VAPORS ADEQUATELY BUT ALSO PROVIDE GOOD AIR AND MOISTURE PERMEABILITY TO MINIMIZE THE PHYSIOLOGICAL STRESS ON THE WEARER. HOWEVER, LITTLE IS KNOWN ABOUT THE MECHANISM OF THE COMBINED PROCESSES OF ORGANIC VAPOR SORTIC AND AIR/MOISTURE PERMEABILITY AS THESE MATERIALS PERMEATE THROUGH THE FABRICS. FMI PROPOSES TO CONDUCT A PROGRAM TO MEASURE THE ADSORPTIVE AND PERMEABILITY PROPERTIES OF ACTIVATED CARBON FIBER FABRICS INDEPENDENTLY. CARBON FIBER YARN WILL BE PREPARED WITH VARYING ADSORPTIVE PROPERTIES AND CHARACTERIZED BY SURFACE AREA AND SORPTION DATA WHEN EXPOSED TO MOISTURE AND SIMULATED

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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TOXIC AGENT VAPORS. THEN, FABRICS OF VARIED CONSTRUCTIONS WILL BE WOVEN FROM THESE YARNS BE ANALYZED AND RELATED TO THE BASIC THEORIES WITH THE SAME VAPORS. THE DATA WILL BE ANALYZED AND RELATED TO THE BASIC THEORIES OF ADSORPTION AND PERMEABILITY. A MECHANISM WILL BE FORMULATED THAT ACCOUNTS FOR THE COMBINED, SIMULTANEOUS PROCESSES OF ADSORPTION AND PERMEATION OF MOISTURE AND ORGANIC VAPORS PERMEATING THROUGH ACTIVATED CARBON FABRIC.

FIBERCOM, INC. POST OFFICE BOX 7317 ROANOKE, VA 24019 PHIL COUCH TITLE: FIBER OPTIC DATA BUS ANAYLSIS AND DEFINITION FOR NAVY APPLICATIONS TOPIC: 93	NAVY	\$ 47,245
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OFFICE: NESC

FIBER OPTIC TECHNOLOGY WHICH HAS BEEN DEVELOPING OVER THE PAST FEW YEARS, OFFERS SIGNIFICANT ADVANTAGES COMPARED TO WIRE DATA LINKS: LOWER LOSS, GREATER BANDWIDTHS, TOLERANCE OF ADVERSE ENVIRONMENTS, AND INSTALLATION FLEXIBILITY. THE INCREASING DATA TRANSMISSION RATES AND DISTRIBUTED PROCESSING ARCHITECTURES OF NAVY SYSTEMS REQUIRE HIGH SPEED DATA BUSES. SOME MILITARY FIBER OPTIC DATA BUS DEVELOPMENT HAS BEEN CONDUCTED, HOWEVER, MUCH COMPONENT TECHNOLOGY AND COMMERCIAL LOCAL AREA NETWORK TECHNOLOGY HAS NOT BEEN APPLIED TO IMPROVE THE COST EFFECTIVNESS OF NAVY SYSTEMS. THE PROPOSED PROJECT WILL ANALYZE NAVY PLATFORM AND SHORE-BASED REQUIREMENTS FOR A HIGH SPEED DATA BUS AND DEFINE THE OPTIMUM BUS CONFIGURATION TO MEET THOSE REQUIREMENTS.

FLOW INDUSTRIES, INC. 21414 - 68TH AVENUE SOUTH KENT, WA 98032 H.T. LIU TITLE: THE DEVELOPMENT OF A PRESSURE TRANSDUCER FOR USAGE IN HIGH TEMPERATURE AND VIBRATION ENVIRONMENTS TOPIC: 16	AF	\$ 61,402
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OFFICE: AED/DPT

THE OBJECTIVE OF THIS PROPOSAL IS TO DEVELOP A HIGH-ACCURACY, LOW RANGE PRESSURE TRANSDUCER WHICH IS SUITABLE FOR MEASUREMENT IN ENVIRONMENTS WHERE HIGH VIBRATION, HIGH TEMPERATURE AND VARYING LINE PRESSURE CREATE PROBLEMS FOR PRESENTLY AVAILABLE TRANSDUCERS.

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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THE PRIMARY SENSOR IS AN ELASTIC METAL MEMBRANCE WHICH FORMS ONE PLATE OF A CAPACITOR. AN ELECTRONIC CIRCUIT CONVERTS THE MEMBRANE DEFLECTIONS INTO VOLTAGE VARIATIONS WHICH ARE SAMPLED BY A MICRO-PROCESSOR. DUE TO THE SMALL OSCILLATING MASS OF THE MEMBRANE, THE TRANSDUCER HAS A HIGH NATURAL FREQUENCY AND IS LARGELY INSENSITIVE TO EXTERNALLY INDUCED VIBRATIONS. THE CAPACITIVE TRANSDUCER CONCEPT OFFERS AN UNUSUAL AMOUNT OF DESIGN FLEXIBILITY AND CAN WITHSTAND LARGE OVERLOADS.

FLOW INDUSTRIES, INC.	NAVY	\$ 95,287
21414 - 68TH AVENUE SOUTH		
KENT, WA 98032		
DR. J. THOMAS MCMURRAY		
TITLE:		
DEVELOPMENT OF OCEAN INSTRUMENTATION FOR BOUNDARY LAYER MEASUREMENTS UNDER ICE		
TOPIC: 115	OFFICE: NAV RESEARCH	

MEASUREMENTS OF THE TURBULENT FLUXES OF MOMENTUM, HEAT, AND SALINITY IN THE OCEANIC BOUNDARY LAYER ARE VERY DIFFICULT TO OBTAIN, AS BOTH A STABLE PLATFORM AND HIGH-RESOLUTION INSTRUMENTATION ARE REQUIRED. THE ARCTIC OCEAN IS ONE REGION IN WHICH HIGH-QUALITY BOUNDARY LAYER STRESS MEASUREMENTS HAVE BEEN OBTAINED BY USING DRIFTING ICE FLOES AS A STABLE PLATFORM FOR INSTRUMENT DEPLOYMENT. SIMILAR MEASUREMENTS ARE PLANNED FOR THE MARGINAL ICE ZONE EXPERIMENT (MIZEX) BUT SUCCESSFUL MEASUREMENTS IN THE MARGINAL ICE ZONE WILL REQUIRE IMPROVEMENTS IN SENSOR RESPONSE AND SYSTEM DESIGN. THE OBJECTIVE OF THE PROPOSED WORK IS TO DEVELOP A BOUNDARY LAYER INSTRUMENTATION SYSTEM CAPABLE OF MEASURING TURBULENT FLUXES IN THE MARGINAL ICE ZONE ENVIRONMENT. THE CENTRAL FEATURE OF THIS SYSTEM WILL BE AN INSTRUMENTATION CLUSTER COMPOSED OF SMALL, PROPELLER CURRENT METERS OR DIODE LASER DOPPLER VELOCIMETERS FOR VELOCITY MEASUREMENTS WITH INTEGRATED TEMPERATURE CONDUCTIVITY SENSORS. THESE MODULES WILL PROVIDE SINGLE POINT MEASUREMENTS OF SYSTEM WILL INCLUDE FRAMES FOR THROUGH ICE DEPLOYMENT OF THE MODULES BENEATH THE ICE AND A MICROPROCESSOR-CONTROLLED DATA ACQUISITION INTERFACE.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
FOSTER-MILLER, INC. 350 SECOND AVENUE WALTHAM, MA 02254 RICHARD LUSIGNEA TITLE: ADVANCED POLYMER UTILIZATION (P-83181) TOPIC: 11c OFFICE: AFWAL/XRPM	AF	\$ 69,820

POLYMERIC MATERIALS WITH EXCEPTIONAL MECHANICAL, CHEMICAL AND THERMAL PROPERTIES ARE BEING DEVELOPED AS PART OF AIR FORCE RESEARCH. THESE MATERIALS FORM RIGID MOLECULAR CHAINS, HENCE THE TERM ROD-LIKE POLYMERS. CHEMICAL SYNTHESIS AND STUDY OF THE MOLECULAR STRUCTURE WILL CONTINUE TO ADVANCE RAPIDLY, AND IMPLEMENTATION OF THE MATERIALS SHOULD PROCEED AT A SIMILAR PACE. THIS WILL DEPEND ON FABRICATING THE BULK MATERIALS INTO PARTS WHICH EXPLOIT THE HIGH STRENGTH, TEMPERATURE RESISTANCE, CHEMICAL RESISTANCE AND OTHER SUPERIOR QUALITIES OF THE POLYMERS. WE PROPOSE TO INVESTIGATE APPLICATIONS AND MANUFACTURING TECHNIQUES FOR ROD-LIKE POLYMERS. BASED ON REVIEW OF THE MOST RECENT MATERIALS AND SURVEYS OF POTENTIAL APPLICATIONS, BOTH CONVENTIONAL AND NOVEL FABRICATION TECHNIQUES WILL BE EVALUATED. THE MOST PROMISING TECHNIQUES WILL BE FURTHER DEVELOPED DURING PHASE II AND III.

FOSTER-MILLER, INC. 350 SECOND AVENUE WALTHAM, MA 02254 ANDREW C. HARVEY TITLE: VENTILATED BAND SEALS FOR NON-MAGNETIC DIESELS TOPIC: 54 OFFICE: NSSC	NAVY	\$ 79,754
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NON-MAGNETIC UNLINED ALUMINUM ENGINE BLOCKS ARE CURRENTLY FEASIBLE IN GASOLINE ENGINES, BUT NOT FOR DIESELS, WHERE PRESSURE LOADINGS AT THE PISTON/CYLINDER INTERFACE ARE MUCH HIGHER. FOSTER-MILLER'S NOVEL "VENTILATED BAND SEAL" APPROACH WILL SOLVE THAT PROBLEM, AND WILL ALSO REDUCE FUEL CONSUMPTION IN ANY PISTON DRIVEN DEVICE. FEATURE INCLUDE: POSITIVE CONTACT FOR LOW LEAKAGE AND DIRT EXCLUSION, A VENTILATED FACE FOR LOW FRICTION AND WEAR, RADICAL COMPLIANCE AND A STATIC BACK SEAL FOR CONFORMANCE TO BORE DISTORTIONS AND TAPER.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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RESEARCH WILL BE CONDUCTED IN A BLIND CYLINDER WITH A PISTON RING PACK DRIVEN BY AN EXISTING SEALED SLIDER CRANK MECHANISM. A THEORETICAL MODEL WILL BE EMPIRICALLY VERIFIED.

FRANKLIN ENGINEERING, CO., INC. 1902 LONGSHORE DRIVE ANN ARBOR, MI 48105 CHARLES H. FRANKLIN TITLE: PNEUMATICALLY DE-ICED STRUCTURAL ICE DETECTOR TOPIC: 9x	ARMY	\$ 50,000
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THE PNEUMATICALLY DE-ICED STRUCTURAL ICE DETECTOR IS DESIGNED TO BE BATTERY OPERATED AND CONSUME VERY LITTLE POWER. THE ICE DETECTOR PROBE AND MOUNTING ARRANGEMENT ARE BOTH PNEUMATICALLY DE-ICED USING GAS OPERATED RUBBER DE-ICER BOOTS. THE PRESSURE IS SUPPLIED BY A COMPRESSED DRY NITROGEN GAS TANK.

THE ICE DETECTOR WILL MEASURE THE WEIGHT OF ICE FORMING ON THE PROBE; IT CAN ALSO MEASURE THE WIND LOADS ON THESE ICE FORMATIONS IN AZIMUTH AND TORSIONAL WIND LOADS THROUGH THE VERTICAL AXIS OF THE ICE DETECTOR. THESE LOADS WILL BE MEASURED BY A FORCE TRANSDUCER LOCATED BETWEEN THE PROBE AND THE MOUNTING SUPPORT.

THE PROBE AND MOUNTING SUPPORT WILL BE DE-ICED PERIODICALLY, DEPENDING ON THE WEIGHT OF ICE ACCUMULATED ON THE PROBE, AND THE INSTRUMENTATION PACKAGE WILL RECORD ALL FUNCTIONS OF THE ICE DETECTOR ALL THIS DATA WILL BE TIME CODED.

FUZETRON POWDER COATING METHODS RESEARCH 8500 ABLETTE ROAD SANTEE, CA 92071 THOMAS W. OAKES TITLE: COATINGS TO REDUCE RADAR CROSS SECTION AND REFLECTANCE IN THE INFRARED AND LASER SPECTRUM TOPIC: 12	NAVY	\$ 54,739
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THERE IS A CONTINUING NEED BY THE MILITARY FOR IMPROVED VISUAL CAMOUFLAGE AND COLORATION TO RENDER OBJECTS LESS VISIBLE FROM CERTAIN BANDS OF ELECTROMAGNETIC RADIATION, ESPECIALLY RADAR CROSS SECTION AND/OR REFLECTANCE IN THE INFRARED AND LASER SPECTRUM. VARIOUS

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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MATERIALS HAVE BEEN APPLIED TO ACCOMPLISH THIS BUT IMPROVEMENTS ARE NEEDED. THIS PROJECT USES A SYSTEMS APPROACH TO THE DESIGN OF INNOVATIVE COATING SYSTEMS. PREVIOUSLY USED MATERIALS AS WELL AS DIFFERENT ONES WILL BE BROUGHT IN AND ORGANIZED AND APPLIED IN NOVEL WAYS TO GAIN INCREASED EFFICIENCY. THERE ARE SEVERAL APPLICATION METHODS THAT ARE THOUGHT TO PRODUCE GREATER ABILITY TO CONTROL THE MOVEMENT OF WAVES. TESTING OF THESE COATINGS WILL BE DONE USING STATE OF THE ART EQUIPMENT AT AN ESTABLISHED FACILITY. IT IS ANTICIPATED THAT METHODS OF LAYERING CAN BE ENHANCED BY RECENT ADVANCES IN HANDLING CONDUCTIVE AND DIALECTRIC MATERIALS, AS WELL AS REFLECTING AND ABSORBING CERTAIN WAVES.

GENERAL OPTRONICS CORPORATION	ARMY	\$ 50,000
2 OLSEN AVENUE		
EDISON, NJ 08820		
DR. C.S. WANG		
TITLE:		
ASSESSMENT OF SINGLE-MODE FIBER OPTIC TECHNOLOGY ON MISSILE		
GUIDANCE		
TOPIC: 3g	OFFICE: DRSMICOM	

THE PRIMARY OBEJCTIVE OF THIS PROGRAM IS TO ASSESS THE APPLICATION OF SINGLE-MODE FIBER OPTIC TECHNOLOGY TO MISSILES THAT CAN SEEK OUT AND DESTROY THE TARGET AT EXTENDED RANGES IN A LOCK ON AFTER LAUNCH MODE. CURRENT FIBER-GUIDED MISSILE SYSTEMS ARE LIMITED IN BOTH DATA-RATE AND LINK LENGTH BECAUSE THEY UTILIZE MULTI-MODE FIBER AND OPERATE AT A LOWER WAVE LENGTH OF .8 MICRONS. THIS STUDY WILL ASSESS THE FEASIBILITY AND COST/PERFORMANCE OF UTILIZING SINGLE-MODE FIBER AND LASERS AT HIGHER DATA RATES AND LINK LENGTHS.

GENERAL RESOURCES CORPORATION	AF	\$ 69,185
207 POWELL STREET, #800		
SAN FRANCISCO, CA 94102		
THOMAS T. RILEY		
TITLE:		
REAL TIME IONOSPHERIC REFRACTION CORRECTION		
TOPIC: 6	OFFICE: AFGL/XOP	

REAL TIME INFORMATION OF IONOSPHERIC PARAMETERS HAS BOTH MILITARY AND SCIENTIFIC USES. WE PROPOSE THE DEVELOPMENT OF A LOW COST DEVICE THAT CONTINUOUSLY TRACKS THE o- ADN x-MODE CRITICAL IONOSPHERIC FREQUENCIES WITH A 1 SECOND TIME RESOLUTION AND A 5 kHz FREQUENCY RESOLUTION. THE

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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RESULTS ARE DISPLAYED IN REAL TIME IN DIGITAL FORMAT. THE CRITICAL FREQUENCY TRACKER" (CFT) TRANSMITS TWO WAVES (o- AND xx-MODE) AT ADJUSTABLE FREQUENCIES AND DETERMINES THE HIGHEST FREQUENCY FOR WHICH THERE IS AN IONOSPHERIC ECHO. AVERAGE TRANSMITTED POWER IS LESS THAN 20 W.

A BISTATIC VERSION OF THE CFT WILL YIELD REAL TIME READOUT OF THE MAXIMUM USEABLE FREQUENCY (MUF) FOR AN IONOSPHERIC PROPAGATION PATH. THE CFT MAY ALSO YIELD INFORMATION ON THE HEIGHT OF THE F2 PEAK IN THE IONOSPHER. WE SUGGEST THAT, WHEN A CFT IS AVAILABLE, IT IS POSSIBLE (BY COMBINING ITS INFORMATION WITH DATA FROM A VHF POLARIMETER) TO DEVELOP A SCHEME THAT PERMITS THE RAPID CALCULATION OF IONIZATION PROFILES USEFUL IN THE REAL TIME CORRECTION OF RADAR AIMING ERRORS OWING TO IONOSPHERIC REFRACTION.

GENERAL SYSTEMS GROUP	ARMY	\$ 49,615
51 MAIN STREET		
SALEM, NH 03079		
RICHARD P. MORTON		
TITLE:		
COST EFFECTIVENESS MODELS FOR SOFTWARE QUALITY RELATED ACTIVITIES		
TOPIC: 8a	OFFICE: BMDSC-CPP	

GSG HAS OBSERVED LIMITED SUPPORT OF MODERN PROGRAMMING PRACTICE BY DOD SOFTWARE CONTRACTORS DUE TO THE RISKS INVOLVED AND THE ABSENCE OF PAY-OFF DATA. CONTRACTORS ALSO HAVE A DIFFICULT TIME ACCURATELY ESTIMATING AND SCHEDULING QUALITY RELATED ACTIVITIES ON SOFTWARE PROJECTS. THIS PROJECT WILL MEASURE COST-EFFECTIVENESS OF QUALITY RELATED ACTIVITIES IN ORDER TO PROVIDE THE MODELS WHICH CAN BE USED TO (A) DETERMINE THE VALUE OF SUCH ACTIVITIES TO CONTRACTORS, (B) ESTIMATE REQUIREMENTS FOR QUALITY RELATED ACTIVITIES, AND (C) SCHEDULE SUCH ACTIVITIES DURING A SOFTWARE PROJECT. THE DATA WILL BE COLLECTED USING REALTIME SOFTWARE DEVELOPMENT PROJECTS AT A LARGE DEFENSE CONTRACTOR. THE IMPACT OF THE RESULTS WILL THEN BE STUDIED IN ORDER TO DETERMINE THE IMPORTANCE OF SUCH COST EFFECTIVENESS INFORMATION ON GOVERNMENT CONTRACTING STRATEGIES.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
GENERAL TECHNOLOGY APPLICATIONS, INC. 12343(D) SUNRISE VALLEY DRIVE RESTON, VA 22091 DR. ALBERT F. HADERMANN TITLE: SAFE/ECONOMICAL PROCESSES FOR ROCKET AND GUN PROPELLANT MANUFACTURE TOPIC: 34 OFFICE: NSSC	NAVY	\$ 49,607

GENERAL TECHNOLOGY APPLICATIONS HAS MADE DEVELOPMENTS AND FILED PATENTS IN THE FIELD OF CHEMICAL PROCESSING WHICH MAKE POSSIBLE LOW SHEAR, LOW FRICTION, TIME-INSENSITIVE BLENDING AND MIXING OF CHEMICALLY REACTIVE AND PHYSICALLY INTERACTIVE MATERIALS. THIS TECHNOLOGY OFFERS A UNIQUE OPPORTUNITY TO THE UNITED STATES NAVY TO IMPROVE UPON THE SAFETY AND ECONOMICS OF MANUFACTURE OF HIGHLY ENERGETIC PROPELLANTS. THE OBJECTIVES OF THIS PROPOSAL ARE TO DEMONSTRATE THE TECHNICAL MERIT OF APPLICATION OF THE GTA PROCESSES TO THE MANUFACTURE OF PROPELLANTS AND TO INVESTIGATE THE VARIOUS SAFETY AND COST IMPROVEMENTS POSSIBLE. GTA PROPOSES TO USE ITS PROPRIETARY MIXING AND BLENDING PROCESS TO PREPARE INERT SAMPLE COMPOSITES WHICH WOULD COMBINE PROPELLANT BINDER MATERIALS WITH VERY FINE GLASS BEADS USED AS SIMULANTS FOR ENERGETIC COMPONENTS. THE BINDER MATERIALS TO BE CHOSEN WOULD EMPHASIZE CHARACTERISTICS WHICH TEST THE LIMITS OF CURRENT ENERGETICS PROCESSING METHODS. GTA DEVELOPMENTS IN THE PROCESSING OF HIGHLY ENERGETIC SYSTEMS CAN LEAD TO SAFETY AND COST BENEFITS BY REDUCING DEPENDENCE UPON CURRENT HIGH SHEAR BATCH MIXING AND BLENDING FACILITIES. MAJOR APPLICATIONS WOULD BE FOR SOLVENTLESS CONTINUOUS PROCESSING OF LARGE VOLUME SYSTEMS AND FOR PRODUCTION OF LOWERED VULNERABILITY GUN PROPELLANTS BASED UPON HIGH PERFORMANCE BINDER SYSTEMS.

GEO-CENTER, INC. 320 NEEDHAM STREET NEWTON UPPER FALL, MA 02164 DR. PETER P. OSTROWSKI TITLE: SOFT IGNITION SYSTEM FOR SELF CONTAINED MUNITIONS TOPIC: 3a OFFICE: DRDAR-ARDC	ARMY	\$ 49,623
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DEVELOPMENT OF A SOFT IGNITION SYSTEM FOR SELF CONTAINED MUNITIONS IS PROPOSED. THE IGNITER WILL RELY ON A LASER/FIBER OPTIC SYSTEM TO ACHIEVE SIMULTANEOUS MULTIPLE POINT IGNITION AT SEVERAL AXIAL LOCATIONS IN THE CENTER CORE PRIMER TUBE. PHASE I OF THE PROGRAM CONSISTS

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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OF A PROOF-OF-PRINCIPLE DEMONSTRATION OF THE CONCEPT THROUGH EXTENSIVE LABORATORY TESTS LEADING TO AN IGNITER TUBE DESIGN WITH UNIFORM FLAMESPREADING CHARACTERISTICS. MUCH OF THE PROPOSED DEVELOPMENT EFFORTS ARE BASED ON KNOWLEDGE AND EXPERTISE WITH LASER IGNITION TECHNOLOGY AND CONCEPTS DEVELOPED IN PREVIOUS PROJECTS FUNDED BY BOTH THE ARMY AND NAVY.

GEO-CENTERS, INC.
320 NEEDHAM STREET
NEWTON UPPER FALL, MA 02164
EDWARD D. PETROW

DARPA \$ 49,774

TITLE:

INFRARED OPTICAL WAVEGUIDES FOR REMOTE POWERING OF SMALL UNDERSEA DEVICES

TOPIC: 1c

OFFICE: DARPA

EXISTING LONG-LINE FIBER OPTIC LINKS UTILIZE VARIOUS LASER DIODES AS SOURCES; GRADED - INDEX, FUSED - SILICA CORE FIBERS AS THE TRANSMISSION MEDIA; AND PHOTO-DETECTING DIODES AS THE RECEIVING DEVICE. BY 1990 IT IS ESTIMATED THAT 10 PERCENT OF THE TOTAL COMMUNICATIONS CABLE INDUSTRY WILL UTILIZE THIS TRANSMISSION METHODOLOGY AS THE CONVENTIONAL, TWISTED WIRE PAIR WILL BE 10 8TH POWER TIMES MORE EXPENSIVE ON A COST/CHANNEL/km BASIS. EVEN AS THE ATTENUATION OF THESE SYSTEM DROPS, THE POSSIBILITY OF POWERING THE PRESENTLY REQUIRED REPEATERS AND OTHER DEVICES DIRECTLY BY EMPLOYING THE SAME METHODOLOGY SEEMS REMOTE WITHOUT THE INVENTION OF A SPECIALIZED SYSTEM, DESIGNED EXPLICITLY FOR THESE POWERING APPLICATIONS. SUCH A SYSTEM EMPLOYING IR WAVELENGTH LASER RADIATION WOULD ENJOY THREE MAJOR BENEFITS: (1; THE QUANTUM EFFICIENCY OF A THERMAL CONVERSION TRANSDUCER IMPROVES WITH INCREASING WAVELENGTH; (2) THE THEORETICAL POSSIBILITIES OF EMPLOYING DIRECT CONVERSION OF DELIVERED IR OPTICAL POWER IS CURRENTLY AVAILABLE FROM COMPACT, FULLY DEVELOPED IR LASERS. THUS, THIS PROPOSAL SEEKS TO INVESTIGATE THE THEORETICAL AND PRACTICAL LIMITATIONS OF ENERGY TRANSMISSION VIA OPTICAL LINKS AND BY ITS SUCCESSFUL COMPLETION SHALL DEFINE AND DEMONSTRATE NEW TECHNIQUES FOR IR POWERING OF REMOTE DEVICES.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
GEOSCIENTIFIC SYSTEMS & CONSULTING 8405 PERSHING DRIVE PLAYA DEL REY, CA 90291 DAVID T. HODDER TITLE: VISIBILITY CHARACTERIZATION BY SPATIAL FREQUENCY ANALYSIS TOPIC: 14h OFFICE: SD/YLXT	AF	\$ 21,099

THIS PROPOSAL IS DIRECTED TO THE OBJECTIVE OF OBTAINING VISIBILITY ESTIMATES FOR "SILENT" AREAS USING DMSP IMAGERY. THE METHOD PROPOSED FOR EVALUATION IS FOURIER ANALYSIS OF DIGITIZED IMAGES TO PERMIT SPATIAL FREQUENCY ANALYSIS OF EITHER NATURAL OR MAN MADE PATTERNS PRESENT IN THE SCENES. CHANGES IN THE SPATIAL FREQUENCY CONTENT FROM ONE AREA TO THE NEXT OR FROM SCENE TO SCENE WOULD BE INDICATIVE OF CHANGES IN VISIBILITY IN THE VERTICAL PATH ABOVE THE TARGET. DMSP-RESOLVABLE TARGETS WOULD BE LARGE DIMENSIONED GEOLOGICAL FEATURES SUCH AS FOLD BELTS AND JOINT PATTERNS AND MUST PRODUCE A STABLE SPATIAL FREQUENCY PATTERN UNDER LIKE VISIBILITY CONDITIONS. USE WOULD BE MADE OF MAN-MADE PATTERNS DUE TO CROP MARKS AND LIGHTED NIGHTTIME CITY GRID PATTERNS. THE TYPE OF SCATTERERS INVOLVED (RAYLEIGH OR MIE) WOULD ALSO BE CONSIDERED BASED ON THE COLOR OF THE TARGET. THE PHASE I EFFORT WOULD BE CONCERNED WITH ESTABLISHING FEASIBILITY BY SELECTING AND EVALUATING TARGETS FROM ACTUAL DMSP SCENE ARCHIVES. CRITERIA WOULD BE STABILITY OF SPATIAL FREQUENCY CONTENT, AND VARIATION WITH VISIBILITY CHANGES. PHASE II EFFORT WOULD INVOLVE FIELD TESTS OF U.S. TARGETS CHOSEN USING CONVENTIONAL VISIBILITY TECHNIQUES AGAINST THE PROPOSED PERIODIC TARGET-CONTRAST METHOD.

GREENBRIAR SYSTEMS, INC. 9900 MAIN STREET, SUITE 303 FAIRFAX, VA 22031 DIXON CLEVELAND TITLE: ADAPTIVE RESOURCE ALLOCATION FOR ADVANCED ELINT/ESM SYSTEMS TOPIC: 1n OFFICE: ERADCOM	ARMY	\$ 49,724
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THIS PROPOSAL ADDRESSES ELINT/ESM SIGNAL PROCESSING RESEARCH FOR REAL-TIME DETECTION IDENTIFICATION AND LOCATION OF THREAT RADAR EMITTERS ON THE BATTLEFIELD. GIVEN THE PREDICTED FUTURE GROWTH OF PULSE DENSITIES IN THE ELECTRONIC ENVIRONMENT, AND THE PROLIFERATION OF

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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AGILE RADARS, IT IS NECESSARY TO DEVELOP MORE SOPHISTICATED ELINT/ESM SYSTEMS. AN ARCHITECTURE IS PRESENTED FOR A COMPUTER-BASED, ADAPTIVE ESM SYSTEM THAT CONTINUALLY ALLOCATES ITS DATA COLLECTION AND ANALYSIS RESOURCES IN ACCORDANCE WITH THE PRESENT QUALITY OF THE INFORMATION AND ANALYSIS RESOURCES IN ACCORDANCE WITH THE PRESENT QUALITY OF THE INFORMATION IT IS GENERATING ABOUT THE RADAR ENVIRONMENT. A CRITICAL FUNCTION IN THE PROPOSED SYSTEM IS THE RESOURCE ALLOCATION FUNCTION ITSELF. IT IS PROPOSED THAT SOFTWARE BE DEVELOPED IN PHASE I TO DEMONSTRATE THE RESOURCE ALLOCATION FUNCTION AND THAT, GIVEN SUCCESS IN PHASE I, A COMPLETE ADAPTIVE ELINT/ESM SIGNAL PROCESSING PACKAGE BE DEVELOPED IN PHASE II. A PROTOTYPE SYSTEM WOULD BE ASSEMBLED AND TESTED IN PHASE III.

GUILD ASSOCIATES, INC.
5625 NORTH HIGH STREET
WORTHINGTON, OH 43085
MR. JOHN SCHLAECHTER

ARMY \$ 63,280

TITLE:

DEVELOPMENT OF LIGHTWEIGHT HIGH CAPACITY PORTABLE OXYGEN SYSTEMS
FOR BATTLEFIELD MEDICAL SUPPORT

TOPIC: 6u OFFICE: SGRD-MRDC

THIS PROJECT SEEKS TO DEVELOP AN ADVANCED OXYGEN GENERATOR FOR USE BY MEDICAL SUPPORT STAFF TO TREAT CASUALTIES IN FORWARD POSITIONS. THE DEVELOPMENT WILL MAKE USE OF AN ADVANCED PRESSURE-SWING ADSORPTION CONCEPT SPECIFICALLY DESIGNED FOR HIGH PRODUCTION CAPACITY-TO-WEIGHT, LOW MAINTENANCE AND HIGH RELIABILITY CHARACTERISTICS. UTILIZING EXISTING EXPERIMENTAL DEVELOPMENT FACILITIES AND SOPHISTICATED ANALYTICAL TECHNIQUES, IT WILL BE POSSIBLE TO ESTIMATE EFFECTS OF CONTAMINANTS SUCH AS CHEMICAL AGENTS AND NOXIOUS SPECIES AS WELL AS CLIMATE EXTREMES ON THE UNIT'S PRODUCTION CAPABILITY.

AN EXPERIENCED CADRE OF ENGINEERS AND SUPPORT STAFF, UNDER THE DIRECTION OF A PREMIER ADSORPTION SPECIALIST WITH 12 YEARS DESIGN, DEVELOPMENT AND MANAGEMENT EXPERIENCE, WILL UNDERTAKE THE PROJECT. GUILD'S ABILITY TO DELIVER ON ITS PROPOSAL COMMITMENTS IS DEMONSTRATED BY THE PENDING AWARD OF A PHASE II DESAT CONTRACT WHICH CRDC AWARDED.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
GYROART 27 OAKLEAF AVENUE AGOURA, CA 91301 JOHN KISHEL TITLE: GYROCOMPASS WITH REDUCED SUSCEPTIBILITY TO SHOCK, VIBRATION AND MOTION TOPIC: 7kk OFFICE: CORP OF ENG	ARMY	\$ 49,921

MODERN ARMY TACTICAL VEHICLES FIELD ARTILLERY FORWARD OBSERVES AND WEAPONS LAUNCHING PLATFORMS REQUIRE HIGHLY ACCURATE AZIMUTH REFERENCE DEVICES THAT ARE SIMPLE, SMALL, RUGGED AND LOW IN COST. GYROCOMPASS TECHNOLOGY HAS EVOLVED VERY SLOWLY AND CURRENT STATE OF THE ART DEVICE ARE CHARACTERIZED BY HIGH COST AND HIGH SENSITIVITY TO VIBRATION, SHOCK AND MOTION INDUCED ERRORS. THE PROPOSED GYROART I GYROCOMPASS REPRESENTS A SIGNIFICANT ADVANCE AND PROMISES TO PROVIDE THE ARMY WITH A LOW COST AZIMUTH MEASURING DEVICE THAT IS LARGELY INSENSITIVE TO BATTLEFIELD DISTURBANCE AND PROVIDE AN AZIMUTH ACCURACY OF 1.69 ARCMINUTES WHEN OPERATED ON ARMY TACTICAL VEHICLES AND LARGE CALIBER WEAPONS WHILE FIRING.

SINCE GYROART HAS ALREADY MADE SUBSTANTIAL INVESTMENTS IN DESIGN AND STUDY OF GYROART I FOR BATTLEFIELD FO APPLICATIONS, THE PHASE I OBJECTIVE WILL BE TO DEMONSTRATE THAT THE GYROART I APPROACH WILL MEET THE ARMY'S REQUIREMENTS FOR VEHICLES AND LARGE CALIBER WEAPONS.

H.S.S. INC. 2 ALFRED CIRCLE BEDFORD, MA 01730 DONALD F. HANSEN TITLE: REMOTE TACTICAL AREA WEATHER SENSOR TOPIC: 1G OFFICE: ERADCOM	ARMY	\$ 55,250
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IF SUCCESSFUL THIS PROGRAM SHOULD LEAD TO THE DEVELOPMENT OF THE VISIBILITY SENSOR REQUIRED BY THE ARMY FOR THE TMQ-30 AUTOMATED METEOROLOGICAL STATION. A FURTHER BENEFIT TO THE ARMY WILL ENSURE IF THE FEASIBILITY OF ADDING A PRESENT WEATHER CAPABILITY TO THE SENSOR

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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CAN BE DEMONSTRATED. THE VISIBILITY SENSOR HAS APPLICATIONS BEYOND THE ARMY'S NEEDS. REMOTE VISIBILITY SENSORS ARE REQUIRED TO MONITOR ENVIRONMENTAL CONDITIONS IN NATIONAL PARKS AND FORESTS. A LOW-COST PORTABLE BATTERY-POWERED VISIBILITY SENSOR HAS FURTHER APPLICATION FOR CHECKING ON RURAL AND URBAN ENVIRONMENTAL CONDITIONS FOR BOTH GOVERNMENT AND PRIVATE INDUSTRY.

HAUSER LABORATORIES P.O. BOX G, 5680 CENTRAL AVENUE BOULDER, CO 80306 DEAN P. STULL TITLE: NOVEL METHOD OF DENTAL ANESTHESIA TOPIC: 6p	ARMY	\$ 49,900
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SELECTIVE APPLICATION OF TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION (TENS) FOR PAIN CONTROL HOLDS PROMISE IN THE AREA OF DENTAL ANESTHESIA APPLICATION OF A NOVEL CARBON FIBER ELECTRODE WITH A SOPHISTICATED YET SIMPLE CONTROL UNIT, WILL LEAD TO AFFECTIVE PAIN CONTROL IN DENTAL APPLICATIONS. MECHANICAL AND ADHESIVE ELECTRODE ATTACHMENT TECHNIQUES WILL BE INVESTIGATED. A NEW POLYACRYLAMIDE/SILICONE PRESSURE SENSITIVE, WATER ACTUATED ADHESIVE WILL BE INVESTIGATED. ELECTRICAL WAVE FORMS AND IMPEDENCE LEVELS WILL BE REVIEWED, AND THE MOST EFFECTIVE LEVELS IDENTIFIED. LIMITED CLINICAL STUDIES WILL CONFIRM THE AFFECTIVENESS OF THE MECHANICAL AND ELECTRICAL PARAMETER FOR PAIN CONTROL. WORKING MODELS WILL BE PRODUCED.

HUMAN PERFORMANCE RESEACH INC. 616 CARLO DRIVE GOLETA, CA 93117 GAIL J. BORDEN TITLE: ANALYSIS OF PECUIAR DEMANDS OF INTERIOR COMMUNICATIONS IN USN SURFACE COMBATANTS TOPIC: 42	NAVY	\$ 49,995
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THE PROPOSED STUDY IS INTENDED TO IDENTIFY THE COMMUNICATION REQUIREMENTS FOR COMBAT OPERATIONS ON USN SURFACE COMBATANTS, AND APPLY THE LASTEST TECHNOLOGIES AVAILABLE IN THE COMMUNICATION INDUSTRY TO DEVELOP DESIGN RECOMMENDATIONS FOR VOICE, DIGITIZED VOICE, AND DIS-

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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PLAY SYSTEMS, AS REQUIRED, TO SATISFY THE COMMUNICATION REQUIREMENTS. THE STUDY WILL RESULT IN 1) SPECIFICATION OF COMBAT COMMUNICATION REQUIREMENTS, 2) IDENTIFICATION OF FUNCTIONAL DESIGN REQUIREMENTS INCLUDING THE SPECIFIC COMMUNICATION CAPABILITIES AND FEATURES REQUIRED TO BE INCORPORATED IN THE RECOMMENDED SYSTEMS, 3) IDENTIFICATION OF TECHNIQUES AND EQUIPMENT RESOURCES AVAILABLE FROM THE COMMUNICATION INDUSTRY CAPABLE OF SATISFYING DESIGN REQUIREMENTS, AND 4) DESCRIPTIONS OF RECOMMENDED SYSTEMS AND CONCEPTUAL DESIGNS EXPRESSED IN FUNCTIONAL DRAWINGS OF REPRESENTATIVE COMPONENTS OF THE SYSTEMS.

IAP RESEARCH, INC. 7546 MCEWEN ROAD DAYTON, OH 45459 JOHN P. BARBER TITLE: MEGAMPERE PULSED POWER SOURCE TOPIC: 13a	AF	\$ 56,430
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SUPERCONDUCTING, INDUCTIVE ENERGY STORES HAVE VERY ATTRACTIVE CHARACTERISTICS FOR MANY AIR FORCE PULSED POWER APPLICATIONS. THEY HAVE VERY HIGH DENSITIES, LOW LOSSES AND CONSTANT CURRENT OUTPUT CHARACTERISTICS. UNFORTUNATELY, THEY ARE LIMITED TO RELATIVELY LOW CURRENT LEVELS, UNSUITABLE FOR SOME OF THE MOST IMPORTANT APPLICATIONS. WE PROPOSE TO DEVELOP A PULSE TRANSFORMER/ENERGY STORAGE CONCEPT WHICH COMBINES THE GOOD FEATURES OF SUPERCONDUCTING STORES WITH THE HIGH CURRENT OUTPUT OF NORMAL INDUCTORS.

IMI-TECH CORPORATION 701 FARGO ELK GROVE VILLAGE, IL 60007 DAVID OKEY TITLE: DEVELOPMENT OF A LIGHTWEIGHT, HIGH STRENGTH, FIBER REINFORCED POLYIMIDE FOAM COMPOSITE TOPIC: 14i	AF	\$ 47,776
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THE AIR FORCE REQUIRES STIFF, STRONG, LIGHTWEIGHT, AND THERMALLY STABLE MATERIALS. THESE MATERIALS ARE NEEDED FOR ACCURATE METEOROLOGICAL DATA GATHERING. IMI-TECH CORPORATION WILL INVESTIGATE VARIOUS FIBERS AND PROCESSES TO MEET THESE NEEDS THROUGH THE APPLICATION OF POLYIMIDE

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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CHEMISTRY, REINFORCEMENTS, AND COMPOSITE MATERIALS TECHNOLOGY. WE WILL DETERMINE THE FEASIBILITY OF PRODUCING CELLULAR, REINFORCED POLY-MIDE MATERIALS, WHICH HAVE GREAT POTENTIAL FOR MEETING THE REQUIREMENT OF THIS PROJECT.

INCOSYM, INC. 780 LAKEFIELD ROAD, SUITE E WESTLAKE VILLAGE, CA 91361 ROBERT J. CRAIG TITLE: GYROCOMPASS WITH REDUCED SUSCEPTIBILITY TO SHOCK, VIBRATION AND MOTION TOPIC: 7KK	ARMY	\$ 49,823
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OFFICE: CORP OF ENG

AT PRESENT INCOSYM, INC. PRODUCES AN AZIMUTH AND INCLINATION MEASUREMENT SYSTEM FOR SURVEYING OIL WELLS. IT IS PROPOSED TO MODIFY THE SOFTWARE OF THIS SYSTEM SO THAT IT CAN BE APPLIED TO MILITARY APPLICATIONS FOR NORTH AND INCLINATION DETERMINATION. THE EXPECTED RESULT IS A SYSTEM THAT CAN FIND TRUE NORTH AND INCLINATION IN THE MINIMUM TIME WHILE SUBJECTED TO SHOCK, VIBRATION AND MOTION.

INDUSTRIAL & BIOMEDICAL SENSORS CORP. 1345 MAIN STREET WALTHAM, MA 02154 KUO WEI CHANG TITLE: A PLASMA DISCHARGE SYSTEM FOR MICROSCOPIC SURFACE ACTIVATION AS A PREAMBLE FOR SURFACE ENHANCEMENT COATINGS TOPIC: 101	NAVY	\$ 58,713
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OFFICE: NASC

SURFACE PASSIVATING LAYERS SUCH AS DIAMOND-LIKE CARBON ARE OFTEN PRODUCED ON LASER WINDOWS, WIND SHIELDS OF HYPERSONIC AIRCRAFT, FIBER OPTICS AND MANY OTHER SURFACES. DESPITE ATTRACTIVE PROPERTIES OF THE COATING MATERIALS, LACKING OF PROPER ADHESION BETWEEN HOST AND COATING MATERIAL FREQUENTLY LIMITS THE USEFULNESS OF THE COATING TECHNIQUES. THE PROPOSED PROCESS IS A PRE-TREATMENT TECHNIQUE WHICH PREPARES THE SUBSTRATE SURFACE FOR THE FORMATION OF CHEMICAL COVALENT BONDS WITH THE COATING MATERIAL FOR DRASTIC ENHANCEMENT OF SURFACE ADHESION. A

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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MICROWAVE INDUCED PLASMA DISCHARGE IMPARTS ENERGY TO A SUITABLE IONIC SPECIES WHICH THEN STRIPS ATOMS FROM THE SURFACE LAYER AND CREATES FREE RADICALS ON THE SUBSTRATE SURFACE. THESE FREE RADICALS, IN TURN, FORM COVALENT BONDS WITH THE COATING MATERIAL APPLIED SUBSEQUENTLY THE EXISTENCE OF STRONG CHEMICAL BONDS CAN PREVENT THE COATING MATERIAL FROM EVER SEPARATING FROM THE SUBSTRATE SURFACE. THE PROPOSED RESEARCH IS DESIGNED TO STUDY AND VERIFY THE UNDERLYING PRINCIPLE WHICH INVOLVES SURFACE ATOM REMOVAL AND FORMATION OF CHEMICAL BONDS. SUBSTRATE MATERIALS USED WILL INCLUDE POLYCARBONATE, FLUOR-CARBONS, POLYIMIDE, SILICONE, SILICA AND OTHER MATERIALS. PRELIMINARY TEST RESULTS SHOW THAT SILICON RUBBER CAN BE ATTACHED TO TEFLON SURFACE WITH SUCH STRENGTH THAT IT CAN NOT BE REMOVED WITHOUT CUTTING OFF PART OF THE TEFLON SURFACE.

INTEGRATED SYSTEMS, INC. 151 UNIVERSITY AVE., SUITE 400 PALO ALTO, CA 94301 NAREN K. GUPTA TITLE: COMPUTER-AIDED-DESIGN SOFTWARE FOR SOLVING TWO-POINT BOUNDARY VALUE PROBLEMS TOPIC: 17D	AF	\$ 58,665
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OFFICE: AD/CZO

AUTOMATIC CONTROL DESIGN AND ANALYSIS, SYSTEM IDENTIFICATION, AND SYSTEMS ANALYSIS FOR COMPLEX DYNAMICAL SYSTEMS ARE ENGINEERING TASKS WHICH CAN BE GREATLY ENHANCED THROUGH AUTOMATED INTERACTIVE (COMPUTER AIDED) DESIGN METHODS. SUCH TECHNIQUES ARE LARGELY UNAVAILABLE IN AEROSPACE, MECHANICAL AND ELECTRICAL ENGINEERING FIELDS WHERE SIGNIFICANT RESOURCES ARE STILL EXPENDED TO DEVELOP SPECIALIZED NON-PORTABLE SOFTWARE USING CUMBERSOME ARCHITECTURES AND RUDIMENTARY QUESTION AND REPLY SYNTAX. THIS PROJECT DEVELOPS A SOPHISTICATED INTERACTIVE DESIGN SYSTEM USING A POWERFUL INTERPRETER, INTEGRATED GRAPHICS PACKAGE, AND STATE-OF-THE-ART NUMERICAL ANALYSIS ROUTINES AND MACRO LEVEL CODES TO SOLVE TWO-POINT BOUNDARY VALUE PROBLEMS. THE SOFTWARE IS BASED IN ANSI 77 FORTRAN TO ALLOW WIDESPREAD USE IN THE ENGINEERING COMMUNITY.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
INTERLOCK DESIGN AND ENGINEERING 7600 BOONE AVENUE NORTH, SUITE 218 MINNEAPOLIS, MN 55428 STEVE KENSINGER TITLE: PROVIDE VALUE ANALYSIS OF RESEARCH TO REDUCE THE VEE-LOCK JOINT TO ITS MOST COST EFFECTIVE MANUFACTURING METHODS TOPIC: 7q OFFICE: AMMRC	ARMY	\$ 20,079

THE VALUE OF LIGHTWEIGHT/HIGH STRENGTH TRIANGLAR TRUSS STRUCTURAL MEMBERS ARE RECOGNIZED FOR THEIR STRENGTH AND DESIGN EFFICIENCY. MULTIPLE SECTIONS MAY BE JOINED TOGETHER WITHOUT THE USE OF TOOLS USING A VEELOCK JOINT ATTACHED TO THE ENDS OF THE TRUSS. THE VEELOCK JOINT WILL CONNECT TO ITSELF INSTANTLY PROVIDING A LONG SPAN OF TRUSS. QUICK-CONNECT/DISCONNECT VEELOCK TRUSS STRUCTURES WOULD HAVE BROADER APPLICATIONS IF BETTER AND MORE ECONOMICAL MEANS OF MANUFACTURING COULD BE FOUND. IN THAT THE VEELOCK IS A UNIQUE DEVICE THERE IS CONSIDERABLE INTEREST IN ITS DEVELOPMENT AND THE MOST COST EFFICIENT MEANS OF MANUFACTURING MUST BE FOUND TO MAKE THE DEVICE ATTRACTIVE IN PRICE TO THE GOVERNMENT. IT IS THE PURPOSE OF THIS RESEARCH TO BALANCE THE OPTIMUM STRUCTURAL DESIGN CRITERIA FOR THE VEE-LOCK WITH THE NEED FOR GREATER COST EFFICIENCY BY ESTABLISHING OPTIMUM MANUFACTURING COST CRITERIA. THEREFORE, THE RESULTS OF VALUE ANALYSIS WILL NOT DEVIATE FROM ESTABLISHED STRUCTURAL CAPACITY OF THE VEE-LOCK TO SIMPLY DECREASE THE COST OF THE DEVICE.

JOHN K. LIU ENTERPRISES INC. POST OFFICE BOX 544 VALLEY FORGE, PA 19481 JOHN K. LIU TITLE: REVERSING GAS TURBINE TOPIC: 53 OFFICE: NSSC	NAVY	\$ 54,593
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THE PROPOSED WORK WILL DETERMINE THE FEASIBILITY OF ACHIEVING DIRECT REVERSAL OF THE POWER TURBINE SECTION OF A MARINE GAS TURBINE OF THE CLASS AND TYPE USED FOR MAIN PROPULSION IN U.S. NAVY SURFACE COMBATANT SHIPS. A THROUGH LITERATURE, PATENT, AND TECHNICAL INFORMATION

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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SEARCH WILL BE MADE TO DETERMINE THE STATE-OF-THE-ART, EXPERIENCE, AND TECHNOLOGY OF REVERSING GAS TURBINES HERE AND ABROAD. CONTACTS WITH LEADING GAS TURBINE MANUFACTURES HERE AND ABROAD, LEADING NAVAL ARCHITECTS, AND NAVAL R & D AGENCIES (Y'ARD, ETC.) WILL BE MADE TO SUPPLEMENT THE SURVEY. CONCEPTUAL DESIGNS WILL BE DEVELOPED, ANALYZED REFINED, AND DETAILED ANALYSES MADE OF THE MOST PROMISING CONCEPTS WITH RESPECT TO THE INTENDED MARINE PROPULSION ENVIRONMENT. AERO-DYNAMIC, HYDRODYNAMIC AND MECHANICAL SOLUTIONS WILL BE CONSIDERED AS LONG AS THEY FALL WITHIN THE CRITERIA ESTABLISHED FOR NAVAL PROPULSION APPLICATIONS.

JP LABORATORIES P.O. BOX 636, 212 DURHAM AVE METUCHEN, NJ 08840 DR GORDHAN N. PATEL TITLE: DOSIMETER FOR CHEMICAL AGENTS TOPIC: 6j	ARMY	\$ 50,000
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OFFICE: SGRD-MRDC

A SIMPLE, INEXPENSIVE, REPRODUCIBLE, AND RELIABLE DOSIMETER DEVICE IS PROPOSED FOR DETECTION OF HIGHLY TOXIC AGENTS SUCH AS NERVE GASES AND VESICANTS. THE COMPOSITIONS USED IN THE DEVICE WILL UNDERGO CATALYTIC CHAIN REACTION TO PRODUCE HIGHLY COLORED COMPOSITIONS, WHEN EXPOSED TO THE TOXIC AGENTS. AS THE AGENTS WOULD ACT AS CATALYST, THE YIELD OF THE HIGHLY COLORED COMPOSITIONS WILL BE VERY HIGH AND HENCE THE DEVICE IS EXPECTED TO BE VERY SENSITIVE. THE PROPOSED DEVICE WOULD DETECT THE AGENTS, AS WELL AS DETERMINE THE TOTAL EXPOSURE (DOSIMETER) AND HENCE, CAN BE USED AT THE WAR FRONTS, PRODUCTION AND STORAGE FACILITIES AND IN THE HOSPITAL LABORATORIES AS AN EARLY WARNING SYSTEM TO PREVENT INJURIES AND DEATH.

KINTON, INC. 1500 NORTH BEAUREGARD STREET, STE 205 ALEXANDRIA, VA 22311 DR. EDGAR L. SHRIVER TITLE: DEVELOPING THE SOFTWARE CHARACTERISTICS TO RUN ENGAGEMENT SIMULATION APPLICATIONS ON MICROCOMPUTERS TOPIC: 5e	ARMY	\$ 49,999
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OFFICE: DCRPMTRADE

HUNDREDS OF SMALL ARMY UNITS NEED PRACTICE IN OPPOSING FORCE OPERATION IN BUILT-UP URBAN AREAS AND OCCLUDED TERRAIN IN GENERAL. SINCE BUILDING CITIES FOR PRACTICE IS IMPRACTICAL THE ALTERNATIVE IS TO DEVELOP GENERALIZED SOFTWARE PACKAGES FOR MAKING SIMULATIONS ON LOW

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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COST MICROCOMPUTERS. EXISTING SOFTWARE PACKAGES WILL PRODUCE COMPUTER GENERATED IMAGES OF TRANSPARENT BUILDINGS AND TERRAIN AS VIEWED FROM A SINGLE LOCATION. THE TACTICAL ENGAGEMENTS NEED SOLID BUILDINGS AND TERRAIN AS VIEWED FROM A SINGLE LOCATION. THE TACTICAL ENGAGEMENTS NEED SOLID BUILDINGS TO OBSCURE WHAT IS BEHIND THEM AND MULTIPLY VIEWPOINTS FOR THE LOCATIONS OF EACH SMALL UNIT PARTICIPANT. THE HARDWARE IS AVAILABLE AT LOW COST. IT IS ONLY THE SOFTWARE TECHNOLOGY THAT IS MISSING. THE PRESENT EFFORT IS TO REDESIGN CGI SOFTWARE PACKAGES SO THAT (1) DIFFERENT VIEWPOINTS ARE AVAILABLE FOR EACH PERSON PARTICIPATING IN A SMALL UNIT ENGAGEMENT SIMULATION AND (2) THE CGI IMAGES ARE NOT TRANSPARENT, I.E., THE IMAGES OCCLUDE WHAT IS BEHIND THEM FOR EACH PARTICIPANT'S VIEWPOINT/LOCATION. SOLUTION OF THESE BASIC TECHNICAL PROBLEMS WILL PROVIDE THE BASIC ELEMENTS OF A GENERALIZED SOFTWARE PACKAGE FOR DEVELOPING LOW COST OPPOSING FORCE SIMULATIONS IN PHASE II THAT MEET A NEED IDENTIFIED BY THE SECRETARY OF DEFENSE AND DEFENSE SCIENCE BOARD.

KUNZ ASSOCIATES, INC. P.O. BOX 14374 ALBUQUERQUE, NM 87191 DR. KAISER S. KUNZ TITLE: BROADBAND HIGH-POWER EW ANTENNA TOPIC: 2	ARMY	\$ 52,101
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A JAMMER TO BE USEFUL IN ELECTRONIC WARFARE NEEDS TO BE OPERABLE OVER A BROAD RANGE OF FREQUENCIES. IN ADDITION, IF IT IS A STAND-OFF JAMMER, IT MUST BE ABLE TO PUT OUT A HIGH-POWER SIGNAL. THE ANTENNA FOR SUCH A JAMMER NEEDS THEREFORE, TO BE BOTH BROADBAND AND CAPABLE OF HANDLING A HIGH-POWER SIGNAL. FINALLY, IT MUST BE RAPIDLY STEERABLE IN ORDER TO DIRECT THE RADIATION AT THE DESIRED TARGETS. ALL ANTENNAS PRESENTLY AVAILABLE FAIL TO MEET AT LEAST ONE OF THESE CRITERIA.

KUNZ ASSOCIATES, INC. PROPOSES TO USE THE ELECTROOPTIC EFFECT AT MICROWAVE FREQUENCIES, TO OBTAIN A THEORETICAL DESIGN FOR A BROADBAND, HIGH-POWER, ELECTRONICALLY STEERABLE ANTENNA. THIS INVOLVES DETERMINING THE BEST ELECTROOPTIC MATERIAL AT MIROWAVE FREQUENCIES RELATIVE TO ITS ELECTROOPTIC COEFFICIENT, POWER CARRYING CAPACITY, MECHANICAL AND ELECTRICAL STABILITY, AND POWER LOSSES.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
L'GARDE, INC. 1555 PLACENTIA AVENUE NEWPORT BEACH, CA 92663 GILBERT J. FRIESE TITLE: HIGH-ACCURACY INFLATABLE REFLECTORS -- PHASE I (LTP-182) TOPIC: 3 OFFICE: AFRPL/TSPR	AF	\$ 50,200

THE ABILITY TO BUILD INFLATABLE PARABOLOID REFLECTORS WITH A SURFACE RMS ACCURACY OF 0.76mm HAS BEEN DEMONSTRATED. THE MAJOR SOURCE OF ERROR IS THE STIFF SEAMS NEEDED WHEN LARGE REFLECTORS ARE MADE. THIS PROGRAM WILL EXAMINE METHODS OF IMPROVING THE SEAM CONFIGURATION TO REDUCE SURFACE ERROR TO 0.1mm OR LESS. LABORATORY CONSTRUCTION AND TESTING OF CANDIDATE SEAMS IN THIN FILM WILL BE NEEDED TO EVALUATE THE CONCEPTS. A VARIETY OF CONCEPTS, MANY OBTAINED DURING A SURVEY OF FILM MANUFACTURERS, WILL BE EXPLORED, AND THE MOST PROMISING IDENTIFIED.

L.N.K. CORPORATION 302 NOTLEY COURT SILVER SPRING, MD 20904 BARBARA A. LAMBIRD TITLE: AN A.I. APPROACH FOR TARGET RECOGNITION IN REAL BATTLE ENVIRONMENTS TOPIC: 113 OFFICE: NASC	NAVY	\$ 50,000
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RESEARCH IS NEEDED TO DEVELOP ALGORITHMS THAT ARE CAPABLE OF TARGET RECOGNITION IN REAL BATTLEFIELD ENVIRONMENTS. L.N.K. CORPORATION PROPOSES TO INVESTIGATE AN ARTIFICIAL INTELLIGENCE TECHNIQUE WHOSE INFERENCE MECHANISM IS NON-DIRECTIONAL (BOTH GOAL-DIRECTED AND DATA-CONFIRMED) FOR RECOGNITION OF TARGETS IN IMAGES. THE ALGORITHM MEETS FOUR CRITERIA: 1) AMBIGUOUS INTERPRETATIONS ARE ALLOWED AND ARE DEVELOPED IN A BEST-FIRST MANNER. THUS, MULTIPLE CONTACTS OF TARGETS ARE RECOGNIZED IN A BEST-FIRST SEQUENCE. 2) GOAL-DRIVEN OR TOP-DOWN OPERATIONS ARE AVAILABLE TO MAKE HYPOTHESES FROM MODELS. 3) BOTTOM-UP OPERATORS ARE AVAILABLE TO INITIATE RECOGNITION, IF EVIDENCE IS PRESENT IN THE DATA. 4) THE ANALYSIS OF THE IMAGE CAN PRECEDE IN A NON-SEQUENTIAL FASHION THROUGH THE IMAGE, TO OPTIMIZE RELIABILITY OF

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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RECOGNITION. RECOGNITION OF PARTIALLY OCCLUDED OBJECTS IS POSSIBLE BECAUSE AN OBJECT IS MODELED BY A HIERARCHY OF SUBSTRUCTURES. A PARALLEL IMPLEMENTATION OF THE ALGORITHM HAS BEEN DEVELOPED TO ALLOW RECOGNITION IN REAL-TIME CONDITIONS.

LA MANCHA COMPANY 808 EAST ZIA ROAD SANTA FE, NM 87501 ROBERT SHREFFLER TITLE: THE NEUTRON BOMB - AN UPDATE TOPIC: 10	DNA	\$ 8,710
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THE PURPOSE OF THIS BRIEF STUDY IS TO REVIEW THE PRESENT STATUS OF ENHANCED RADIATION WEAPONS FROM A TECHNICAL, MILITARY, AND POLITICAL POINT OF VIEW, AND TO MAKE RECOMMENDATIONS REGARDING THE FUTURE OF THESE WEAPONS. THERE ARE A NUMBER OF INTERRELATED REASONS FOR UNDERTAKING SUCH A TASK AT THIS TIME.

- FOR A NUMBER OF REASONS THERE APPEARS TO BE A GENERAL RELUCTANCE TO CONTINUE THE ERW DEBATE AT THIS MOMENT. THIS AFFORDS A TIME FOR OBJECTIVE REFLECTION ON THE MATTER.

- NEGATIVE OPINIONS ON ERW BY FORMER SUPPORTERS MERIT REVIEW
- THE BASIC TECHNICAL AND MILITARY MOTIVATION FOR MAINTAINING THE NATO THEATRE NUCLEAR STOCKPILE IN GENERAL AND TNWs IN PARTICULAR IS BECOMING A PRESSING ISSUE.

- THE FUTURE OF AFAP, LANCE, AND THE CORPS SUPPORT WEAPON, PARTICULARLY AS THEY INVOLVE ER WARHEADS, SHOULD BE ANALYZED. A MORE DETAILED EXPOSITION OF THESE POINTS IS PRESENTED IN THE ATTACHED PROPOSAL.

LAGUNA RESEARCH LABORATORY 21421 STANS LANE LAGUNA BEACH, CA 92651 HENDRICUS G. LOOS TITLE: HIGH-PRESSURE CAPILLARY INFUSION DEVICE TOPIC: 6y	ARMY	\$ 62,078
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THERE IS A GREAT NEED FOR A NON-GRAVITATIONAL INTRAVENOUS INFUSION DEVICE WHICH CAN DELIVER AMOUNTS OF FLUID AT A REQUIRED RATE WITHOUT SUPERVISION FOR USE AT THE FRONT LINE AND DURING TRANSPORT OF THE WOUNDED. SUCH A DEVICE SHOULD BE COMPACT, RUGGED, EASILY APPLIED,

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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AND EASILY STORABLE FOR INDEFINITE TIME. AN APPROACH WHICH APPEARS TO HAVE THE POTENTIAL FOR SATISFYING THESE REQUIREMENTS UTILIZES A CONSTANT HIGH PRESSURE AND IV FLUID FLOW THROUGH A CAPILLARY. PRESSURE VARIATIONS DUE TO POSITIONAL CHANGES AND OTHER INCIDENTAL EFFECTS ARE SMALL COMPARED TO THE LARGE PRESSURE DIFFERENCE ACROSS THE CAPILLARY, AND THEREFORE CAUSE NEGLIGIBLE FLOW RATE CHANGES.

IN THE PHASE I STUDY, THE FEASIBILITY OF THIS APPROACH WILL BE ASSESSED BY INVESTIGATING THE FLOW RATE VARIATIONS DUE TO EXPECTED HEAD CHANGES, TEMPERATURE EFFECTS, AND FLUCTUATIONS OF THE REGULATED PRESSURE. PRACTICAL FEATURES, SUCH AS SIZE, SHAPE, WEIGHT, RUGGEDNESS AVOIDANCE OF BUBBLES, EASE OF APPLICATION, AND EASE OF STORAGE WILL ALSO BE CONSIDERED IN THE FEASIBILITY STUDY.

IT IS EXPECTED THAT FEASIBILITY OF THE DEVICE WILL BE SHOWN. THE PHASE I STUDY WILL ALSO PROVIDE DESIGN THEORY AND GUIDANCE REQUIRED IN THE PHASE II WORK.

LAUREN MANUFACTURING COMPANY	ARMY	\$ 33,654
2228 REISER AVE. SE		
NEW PHILADELPHIA, OH 44663		
FRANCIS M. DAUGHERTY		
TITLE:		
FLOURELASTOMER COATINGS FOR MATERIALS PROTECTION IN CHEMICAL		
WARFARE ENVIRONMENT		
TOPIC: 4c	OFFICE: DRXMR-TACOM	

LAUREN OFFERS A UNIQUE FLOUROELASTOMER COATING TECHNOLOGY EMPLOYING DUPONT'S VITON, A FLOUROPOLYMER KNOWN TO BE HIGHLY RESISTANT TO CW AGENTS, SIMULANTS, AND DECONTAMINANTS. LAUREN PROPOSES TO FORMULATE CANDIDATE COATING SYSTEMS FOR USE WITH ELASTOMERS OF INTEREST TO THE ARMY. SEVERAL CANDIDATE FLOUROPOLYMERS WOULD BE USED, IN COMBINATION WITH VARIOUS PROPORTIONS OF CURATIVES. ELASTOMER SAMPLES WILL BE PREPARED WITH VARIOUS COATING SYSTEMS FOR TESTS AT AMMRC.

LEHRER-PEARSON, INC.	AF	\$ 70,000
1175 KOTTINGER DRIVE		
PLEASANTON, CA 94566		
J. W. PEARSON		
TITLE:		
RESEARCH ON THE CORRELATION BETWEEN ELECTROSTATIC FIELD INTEGRITY		
AND THE PERFORMANCE OF ELECTRON GUNS		
TOPIC: 11i	OFFICE: AFWAL/XRPM	

IT IS NOW FEASIBLE TO BUILD A THERMIONIC EMITTER (ELECTRON GUN) WITH 25 TO 50 TIMES GREATER PRECISION OF ELECTRODE FORM AND POSITION THAN HAS BEEN CONVENTIONALLY ACHIEVABLE. LEHRER-PEARSON, INC., (LP) WILL DO THIS USING A DESIGN CONCEPT (PATENT PENDING) THAT ALLOWS, FOR THE

NO-A166 807

DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM
(SBIR) ABSTRACTS OF PHASE 1 AWARDS 1983(U) DEPARTMENT
OF DEFENSE WASHINGTON DC 06 APR 84

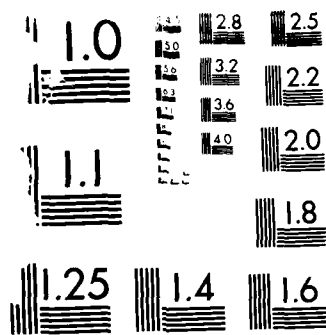
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MICROCOPY RESOLUTION TEST CHART
 NATIONAL BUREAU OF STANDARDS-1963-A

FISCAL YEAR 1983

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FIRST TIME, HIGH PRECISION CONTROL OF ELECTRODE FORM AND POSITION. WHAT THIS MIGHT DO TO IMPROVE BEAM QUALITY IS PRESENTLY UNKNOWN. LP PROPOSES TO USE MODERN MATERIALS AND STATE OF ART PRECISION TECHNOLOGY TO CONTROL A SCHEDULE OF ELECTROSTATIC FIELD PATTERNS IN TEST GUNS. DATA FROM THESE TEST GUNS WILL BE USED TO DEFINE THE PRESENTLY UNDEFINED PORTION OF THE CURVE OF ELECTRODE PRECISION VS BEAM QUALITY. IT IS IMPORTANT FOR DESIGN PURPOSES TO KNOW THE BREAK OF THE PRECISION VS PERFORMANCE CURVE; THAT IS, WHERE IMPROVING ELECTRODE FORM AND POSITION PRECISION DOES NOT SIGNIFICANTLY IMPROVE BEAM QUALITY. THIS PROPOSAL IS AN EFFORT TO DETERMINE THE FEASIBILITY OF DEFINING A PRECISION VS PERFORMANCE CURVE.

LIXI, INC. 1438 BROOK DRIVE DOWNERS GROVE, IL 60515 BRUCE VAN PELT TITLE: THE LIXISCOPE AS A PORTABLE X-RAY FLUOROSCOPE FOR FORWARD COMBAT AREAS TOPIC: 6u	ARMY	\$ 49,775
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THIS PROPOSAL IS TO DEVELOP REAL-TIME X-RAY EQUIPMENT FOR SURGICAL AND MEDICAL USE IN FORWARD COMBAT AREAS THAT ARE SMALL, LIGHTWEIGHT, ENERGY EFFICIENT AND SELF-SUFFICIENT. THIS EQUIPMENT WOULD HAVE TO BE HIGHLY PORTABLE AND RELIABLE. THE WORK WILL ENTAIL THE DETERMINATION OF THE VARIOUS MEDICAL TASKS THAT NEED TO BE PERFORMED AND THE IMPROVEMENT OF THE BASIC LIXISCOPE CONCEPT TO SUIT THESE PARTICULAR NEEDS. IT IS EXPECTED THAT THE SYSTEM WILL BE CAPABLE OF RESOLVING 6 LINES PAIRS PER MILLIMETER AND CONFIGURED IN SUCH A WAY AS TO MAXIMIZE OPERATOR AND PATIENT COMFORT AND CONVENIENCE WHILE MINIMIZING RADIATION EXPOSURE. THE EQUIPMENT WILL BE SEALED TO PROVIDE RESISTANCE TO ADVERSE ENVIRONMENTAL CONDITIONS. IT WILL BE BATTERY DEVICE WHICH ARE IMPORTANT ATTRIBUTES WHERE MOBILITY IS IMPORTANT AND ELECTRICITY IS NOT AVAILABLE.

LNK CORPORATION, INC. 302 NOTLEY COURT SILVER SPRING, MD 20904 MS BARBARA A. LAMBIRD TITLE: RESEARCH ON THE FUSION OF INTELLIGENCE IN A DISTRIBUTED PROBLEM-SOLVING ENVIRONMENT TOPIC: 5k	ARMY	\$ 50,000
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A TACTICAL OPERATIONS CENTER (TOC) CAN BE MODELLED BY A DISTRIBUTED PROBLEM-SOLVING ENVIRONMENT. ONE OF THE FUNCTIONS OF A TOC IS THE GATHERING AND INTERPRETATION OF INTELLIGENCE. THE REQUIREMENTS FOR INTERPRETATION OF INTELLIGENCE MAKE SEVERE DEMANDS ON AVAILABLE PER-

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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SONNEL DURING COMBAT SITUATIONS, DUE TO THE LARGE AMOUNTS OF INFORMATION AND ITS UNRELIABILITY. WE PROPOSE TO STUDY A DISTRIBUTED PROBLEM-SOLVING DESIGN FOR INTERACTIVE FUSION OF INTELLIGENCE. WE WILL INVESTIGATE THE USE OF A NON-DIRECTIONAL CONTROL PROCEDURE THAT WE HAVE DEVELOPED AND FOUND USEFUL IN OTHER CONTEXTS. WE PROPOSE TO REPRESENT THE ANALYSIS OF INTELLIGENCE AS A HIERARCHY OF SPECIALISTS THAT CAN WORK TOGETHER. WE ALSO PROPOSE TO INVESTIGATE A PARALLEL VERSION OF THE CONTROL PROCEDURE THAT COULD GREATLY INCREASE THE PROCESSING SPEED. FINALLY, WE PLAN TO INVESTIGATE METHODS FOR COMBINING BELIEFS FROM VARIOUS EXPERTS. THIS PROBLEM IS VERY IMPORTANT BECAUSE OF THE OVERLAPPING AND CONTRADICTORY NATURE THAT IS INHERENT IN INTELLIGENCE FUSION.

LNR COMMUNICATIONS, INC. 180 MARCUS BLVD. HAUPPAUGE, NY 11788 JOHANNES A. deGRUYL TITLE: SPACEBORNE 20 GHz SSPA THERMAL MECHANICAL CONFIGURATION DESIGN STUDY TOPIC: 14f	AF	\$ 49,993
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UNDER A CURRENT AFWAL CONTRACT, AND UNDER INTERNAL SPONSORSHIP, LNR COMMUNICATIONS, INC. HAS DEVELOPED AND DEMONSTRATED BRASSBOARD 20 W, 20 GHz IMPATT SOLID STATE POWER AMPLIFIERS (SSPA's) WITH A 1 GHz BANDWIDTH AND IN BOTH 4 AND 8-WAY COMBINATORIAL CONFIGURATIONS. THUS, SINCE ALL OF THE BASIC EHF TECHNOLOGY FOR A 20 GHz SSPA ARE WELL ESTABLISHED AT LNR, THE STRESS OF THE PROPOSED STUDY WILL NOT BE ON THE BASIC TECHNOLOGY PER SE, BUT WILL BE DIRECTED TOWARDS THE NECESSARY DESIGN TRADE-OFFS AND CONFIGURATION STUDIES TO MAXIMIZE COMPATABILITY WITH SPACECRAFT ENVIRONMENT. WITH THE CURRENT AVAILABLE TECHNOLOGY, THE SSPA CAN BE CONFIGURED WITH VARIOUS COMBINATIONAL GEOMETRIES, EACH HAVING DIFFERENT HEAT FLOW PATHS AND DISTRIBUTIONS OF HOT SPOTS, ETC. THEREFORE, IT IS OF UTMOST IMPORTANCE TO DETERMINE WHICH CONFIGURATION IS MOST SUITED FOR COMPATABILITY WITH THE THERMAL ENVIRONMENT OF THE SPACECRAFT AND TO DETERMINE THE EXPECTED CAPABILITY OF HEAT TRANSFER IN SPACE. WE THEREFORE PROPOSE A 6 MONTH COMPREHENSIVE TRADE-OFF STUDY TO OPTIMIZE THE INTERFACING OF THE GENERAL

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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PROPERTIES OF THE SSPA WITH THE ALLOWABLE CONDITIONS OF A SPACE ENVIRONMENT BASED ON PROPERLY WEIGHTED INPUTS FROM SPACECRAFT CONTRACTORS AND END USERS. THE PROPOSED STUDY WILL RESULT IN A FINAL REPORT PRESENTING AN OPTIMIZED 20 GHz SSPA DESIGN APPLICABLE TO THE SUBSEQUENT IMPLEMENTATION OF A "FULL UP" SPACE QUALIFIED MODEL.

MARANANTHA RESEARCH, LIMITED 1913 GLENVIEW DRIVE BERTHOUD, CO 80513 MICHAEL A. WILSON TITLE: SNOW LIQUID PHASE MOISTURE METER PROJECT TOPIC: 1q	ARMY	\$ 66,000
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TOPIC 1-Q OF THE DEPARTMENT OF DEFENSE OMNIBUS SOLICITATION SPECIFIES THE MEASUREMENT OF LIQUID WATER CONTENT OF SNOW. NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY HAS THE ABILITY TO DETECT AND MEASURE LIQUID CONTENT WITHOUT MEASURING SOLID DENSITY. FORTUNATELY THE HYDROGEN RESONANCE SIGNAL FROM H2O IS PROBABLY THE STRONGEST NMR SIGNAL AVAILABLE. THIS COMBINATION OF CIRCUMSTANCES SHOULD PERMIT THE DESIGN OF A CMOS MICROPROCESSOR BASED NMR SPECTROMETER RELATIVELY LOW RESOLUTION WHICH HAS THE CAPABILITY OF MEASURING THE AREA UNDER THE HYDROGEN LINE AND COMPUTING FREE WATER CONTENT OF SNOW. THE TWO MAJOR PROBLEMS WILL BE ACHIEVEMENT TO A SUFFICIENTLY UNIFORM MAGNETIC FIELD OF SUFFICIENTLY KNOWN STRENGTH, AND SUFFICIENT OSCILLATOR STABILITY. ONLY THE FACT THAT THE DESIRED SIGNAL WILL BE SEVERAL ORDERS OF MAGNITUDE LARGER THAN ANY SPURIOUS SIGNALS MAKES THE DESIGN PRACTICAL. THE DESIGN APPROACH WILL USE CERAMIC MAGNETS TO ESTABLISH A BASE MAGNETIC FIELD. FIELD COILS WILL SWEEP THE FIELD OVER SUFFICIENT RANGE TO COVER ALL TOLERANCES. THE MICROPROCESSOR WILL CAPTURE AND MEASURE THE HYDROGEN RESONANCE PEAK.

MARKO MATERIALS, INC. 144 RANGEWAY ROAD NORTH BILLERICA, MA 01862 RANJAN RAY TITLE: TITANIUM ALLOYS WITH IMPROVED HIGH TEMPERATURE STRENGTH MADE VIA A RAPID SOLIDIFICATION POWDER PROCESS TOPIC: 11d	AF	\$ 64,906
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TITANIUM ALLOYS WITH IMPROVED HIGH TEMPERATURE CAPABILITIES ARE OF STRONG INTEREST TO THE U. S. AIR FORCE FOR POTENTIAL MILITARY APPLICATIONS. RAPID SOLIDIFICATION TECHNOLOGY (RST) OFFERS EXCELLENT PROSPECTS FOR CREATION OF NEW STRUCTURAL ALLOYS WITH SUPERIOR PROPERTIES

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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NOT ACHIEVABLE BY CONVENTIONAL METALLURGY. MARKO MATERIALS UNDER THE PROPOSED PHASE I INVESTIGATION INTENDS TO DEVELOP A NEW METHOD BASED ON MELT-SPINNING FOR MANUFACTURING POWDERS OF DIFFICULT-TO-PROCESS TITANIUM ALLOYS. USING THIS PROCESS, MARKO WOULD EXPLORE NEW TITANIUM ALLOYS WITH GOALS TO ACHIEVE IMPROVED HIGH TEMPERATURE PROPERTIES VIA THE DISPERSION HARDENING EFFECTS OF TITANIUM BORIDE PHASES. CONVENTIONAL ALPHA AND ALPHA-BETA ALLOYS MODIFIED WITH 1-2 PERCENT BORON WILL BE RAPIDLY SOLIDIFIED INTO METASTABLE PHASES. UPON DECOMPOSITION OF AS-SOLIDIFIED PHASES AT HIGH TEMPERATURES DURING CONSOLIDATION PROCESSING, A THERMALLY STABLE DISPERSION OF BORIDE PHASES IN A FINE GRAINED MATRIX WILL BE GENERATED. SUCH MICROSTRUCTURES WILL LEAD TO IMPROVED TENSILE, CREEP, AND FATIGUE PROPERTIES AT ELEVATED TEMPERATURES.

MASSA PRODUCTS CORPORATION
280 LINCOLN STREET
HINGHAM, MA 02043
FRANK MASSA

AF

\$ 46,762

TITLE:

DYNAMIC PRESSURE TRANSDUCER CALIBRATIONS FROM 0.1 TO 1.0 PSI OVER
FREQUENCY RANGE 10 Hz TO 5kHz

TOPIC: 16d OFFICE: AEDC/DOT

A PORTABLE ELECTROACOUSTIC CALIBRATION TEST SET TO PERMIT THE CONVENIENT CALIBRATION OF THE DYNAMIC PRESSURE MEASUREMENT OVER THE PRESSURE RANGE 0.1 psi AND OVER THE FREQUENCY RANGE 10 Hz TO 5 kHz WILL BE COMPLETELY DESIGNED DURING PHASE I. THE TEST CHAMBER WILL COMPRISE A RIGID WALLED ENCLOSURE OF MINIMUM VOLUME WITH A MAXIMUM LINEAR DIMENSION OF 5/8" TO PREVENT STANDING WAVES AT 5 kHz. A REFERENCE STANDARD MICROPHONE WILL BE DESIGNED TO BE INSERTED THROUGH THE WALL OF THE TEST CHAMBER FOR THE PURPOSE OF MONITORING THE PRESSURE GENERATED IN THE CAVITY BY A TRANSMITTING TRANSDUCER THAT WILL BE DESIGNED TO BE COUPLED THROUGH ANOTHER OPENING IN THE WALL OF THE TEST CHAMBER. THE TRANSMITTING TRANSDUCER WHEN DRIVEN FROM A VARIABLE FREQUENCY OSCILLATOR WILL GENERATE ANY DESIRED SOUND PRESSURE UP TO AT LEAST 1 psi AT ANY FREQUENCY OVER THE BAND 10 Hz TO 5 kHz. A THIRD OPENING IN THE CHAMBER WALL WILL RECEIVE THE PRESSURE MEASUREMENT MICROPHONE WHICH IS TO BE CALIBRATED. THE OUTPUTS FROM THE REFERENCE STANDARD MICROPHONE AND THE MICROPHONE BEING CALIBRATED ARE

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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CONNECTED TO SEPARATE DESIGNATED TERMINALS ON THE PANEL OF A PORTABLE ELECTRONICS CONSOLE THAT WILL CONTAIN THE NECESSARY ELECTRONICS TO COMPARE THE OUTPUT SIGNALS FROM THE REFERENCE STANDARD AND THE MICROPHONE BEING TESTED WHEREBY THE ABSOLUTE CALIBRATION OF THE MICROPHONE BEING TESTED WILL BE ACCOMPLISHED.

MATERIAL CONCEPTS, INC.
666 NORTH HAGUE AVENUE
COLUMBUS, OH 43204
EDWIN W. SCHMIDT, JR.

ARMY

\$ 49,683

TITLE:

SONIC FABRICATION OF PARTICULATE METAL MATRIX COMPOSITES
TOPIC: 7F OFFICE: DRXMR-PPBRDC

A METHODOLOGY IS PRESENTED WHICH WILL ESTABLISH THE FEASIBILITY OF DISPERSING PARTICULATE REINFORCEMENT IN ALUMINUM MATRICES TO FORM COMPOSITE MATERIAL. THE METHOD TO BE EMPLOYED IS UNIQUE IN THAT IT UTILIZES LIQUID ALUMINUM, RATHER THAN POWDER METALLURGY DISPERSAL TECHNIQUES, AND IS THUS POTENTIALLY MUCH MORE ECONOMICAL THAN CURRENT METHODS. EVALUATION OF COMPOSITES PRODUCED BY THIS METHOD WILL UNDERTAKE AS A GUIDE TO FUTURE DEVELOPMENT EFFORTS IN THIS AREA.

MERIX CORPORATION
192 WORCESTER STREET
WELLESLEY, MA 02181
THOMAS W. MIX

ARMY

\$ 74,823

TITLE:

FORMULATION FOR PROTECTION/TREATMENT OF PERSONNEL EXPOSED
TO CW AGENTS
TOPIC: 6e OFFICE: SGRD-MRDC

CHEMICAL WARFARE AGENTS POSE A THREAT TO OUR FORCES WHICH REQUIRES A COUNTERMEASURE WHICH DOES NOT RESTRICT THE MOBILITY OR OPERATING EFFECTIVENESS OF THE SOLDIERS AND WHICH CAN BE READILY DEPLOYED. THE OBJECTIVES OF THE PROGRAM ARE THE DEVELOPMENT OF SPECIALTY FORMULATIONS WHICH WILL PROTECT AND /OR TREAT PERSONNEL EXPOSED TO CW AGENTS. FORMULATIONS WILL BE CONCEPTUALIZED WHICH WILL AFFORD THE DESIRED PROTECTION AND /OR TREATMENT AND ANALYTIC MODELS WILL BE DEVELOPED TO ENABLE THE COMPUTER SIMULATION OF THE PERFORMANCE OF

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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THESE FORMULATIONS. THEY WILL BE CAPABLE OF BEING APPLIED DIRECTLY TO THE SOLDIER'S SKIN OR TO HIS CLOTHING. IT APPEARS FEASIBLE TO GENERATE FORMULATIONS WHICH WILL BE EFFECTIVE, OF LOW TOXICITY, EASILY SYNTHESIZED, READILY APPLIED, WITH A LONG SHELF LIFE AND CAPABLE OF PRODUCTION IN LARGE QUANTITY ON SHORT NOTICE. EXPERIMENTAL WORK WILL BE CARRIED OUT TO DEMONSTRATE THE FEASIBILITY OF THE CONCEPT AND TO CHECK THE ACCURACY OF THE ANALYTIC MODEL. THE POTENTIAL FOR THE USE OF THESE FORMULATIONS WITHIN THE U.S. ARMY WILL BE EVALUATED.

MICROWAVE LABORATORIES, INC. 3805 BERYL ROAD RALEIGH, NC 27607 CARL A. EVERLEIGH TITLE: INCREASE THE BANDWIDTH OF THE BAND-9 ALQ-99 TOPIC: 94	NAVY	\$ 48,650
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THIS PROPOSAL DESCRIBES A HELIX CIRCUIT FOR THE BAND 9 ALQ-99 TWT THAT WILL EXTEND THE TRANSMITTER FREQUENCY COVERAGE WELL ABOVE ITS EXISTING LIMIT. THE DESIGN APPROACH FEATURES A SUPPORT STRUCTURE THAT EFFICIENTLY EXTRACTS HEAT FROM THE HELIX, THEREBY ENHANCING ITS THERMAL CAPABILITY. PHASE I IS DEVOTED TO CONFIRMING THE VIABILITY OF THIS DESIGN APPROACH BY STUDYING ELECTRICAL, MECHANICAL, AND THERMAL TRADE-OFFS.

MICROWAVE MONOLITHICS INC. 465 E. EASY STREET, UNIT F SIMI VALLEY, CA 93065 DANIEL R. CH'EN TITLE: FLASH ANNEALING OF ION IMPLANTED DOPING PROFILES FOR HIGH PERFORMANCE X-BAND GaAs POWER FETS TOPIC: 8k	ARMY	\$ 49,600
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THIS PROGRAM WILL ADDRESS THE APPLICATION OF THE FLASH ANNEALING TECHNIQUE TO THE FABRICATION OF HIGH-PERFORMANCE ION IMPLANTED GaAs POWER FETS. THE DOPING PROFILE OF THE ACTIVE LAYER USED IN THESE MUST EXHIBIT A SHARP ACTIVE LAYER-SUBSTRATE INTERFACE SO THAT ABRUPT PINCH-

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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OFF CAN BE OBTAINED. THIS IS VERY IMPORTANT IN ORDER TO OBTAIN HIGH POWER OUTPUT CAPABILITY AND EFFICIENCY, ESPECIALLY WHEN THE DC POWER IS THROTTLED DOWN. THE ABILITY OF THE FLASH ANNEALING IN PRODUCING SHARP DOPING PROFILES THROUGH REDUCTION OF DIFFUSION DURING HIGH-TEMPERATURE PROCESSING WILL MAKE POSSIBLE HIGHER PERFORMING POWER FETS. THE PRECISE SYNTHESIS OF DOPING PROFILES WITH FLASH ANNEALING OF MULTIPLE ION IMPLANTATION WILL BE STUDIED. THE ENHANCEMENT IN PERFORMANCE SUCH AS POWER OUTPUT, EFFICIENCY, GAIN, AND DYNAMIC RANGE OF POWER FETS USING THESE DOPING PROFILES WILL BE DEMONSTRATED.

MICROWAVE MONOLITHICS INCORPORATED P.O. BOX 5044-224 THOUSAND OAKS, CA 91359 DANIEL R. CH'EN TITLE: INNOVATIVE HIGH VOLUME PRODUCTION TESTING OF MMIC'S TOPIC: 9a	AF	\$ 70,000
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OFFICE: RADC/DORP

EFFICIENT HIGH VOLUME TEST CAPABILITY FOR MONOLITHIC MICROWAVE INTEGRATED CIRCUITS (MMIC'S) IS A VITAL STEP TOWARD HIGH VOLUME DoD SYSTEMS IMPLEMENTATION AND THE REALIZATION OF THE POTENTIAL OF THIS RAPIDLY EMERGING TECHNOLOGY. A DETAILED APPROACH TO DEVELOP COST EFFECTIVE AUTOMATIC TEST PROCEDURES FOR MMIC'S IS PROPOSED TO RADC. DESCRIBED IN THE PROPOSAL ARE (A) DEVELOPMENT OF DESIGN RULES TO INSURE MMIC TESTABILITY, (B) COST EFFECTIVE LOW FREQUENCY EVALUATION CRITERIA UNIQUE TO MMIC'S, (C) DETERMINATION OF THE PROPER TESTS AND TEST LOCATIONS OF IN-PROCESS MMIC EVALUATION, AND (D) THE DESIGN OF BOTH LOW FREQUENCY AND RF AUTOMATIC TEST STATIONS TO IMPLEMENT THE PROPOSED TEST STRATEGY. KEY TO THE PROPOSED PROGRAM ARE AN INTEGRATED APPROACH WHICH PLACES THE BULK OF THE TESTING RESPONSIBILITY ON LOW FREQUENCY MEASUREMENTS AND THE CORRESPONDING REQUIREMENT THAT EXCELLENT CORRELATION BETWEEN LOW AND HIGH FREQUENCY (RF) MEASUREMENTS BE ESTABLISHED FOR MMIC CHIPS.

MIDAC CORPORATION 1599 SUPERIOR AVE. B-3 COSTA MESA, CA 92627 GERALD L. AUTH TITLE: XM21 RETROFIT TOPIC: 4a	ARMY	\$ 70,000
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OFFICE: DRDAR-CRDC

THE CURRENT XM21 SUFFERS FROM AN OVER-SENSITIVITY OF THE INTERFEROMETER TO MECHANICAL VIBRATIONS. SINCE THE COMMON MODULE COOLER GENERATES MECHANICAL VIBRATIONS, THIS SENSITIVITY IS UNFORTUNATE. REPAIR ATTEMPTS TO DATE HAVE FOCUSED ON TRYING TO ISOLATE THE INTER-

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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FEROMETER FROM THE COOLER VIBRATIONS, HOWEVER ISOLATION CREATES ADDITIONAL PROBLEMS. MIDAC PROPOSES TO SOLVE THE VIBRATION SENSITIVITY PROBLEM, THUS ELIMINATING THE ROOT OF SYSTEM DIFFICULTIES. THE MIDAC SILICON MEASUREMENT SYSTEM ALREADY INCORPORATES INTERFEROMETERS WITH CLOSED-CYCLE DETECTOR COOLERS. MIDAC HAS ALSO ALREADY BUILT AND TESTED THE BASIC XM21 INTERFEROMETER, HAS STUDIED ITS DESIGN WEAK POINTS AND KNOWS HOW TO ELIMINATE THEM. AS PART OF THIS EFFORT, WE WOULD INCORPORATE A HIGH SENSITIVITY ROOM TEMPERATURE DETECTOR, WHICH WILL ADDRESS ADDITIONAL SYSTEM PROBLEMS OF POWER, WEIGHT AND COST.

MIDWEST SYSTEMS RESEARCH, INC.	AF	\$ 56,000
5899 HUBERVILLE AVENUE		
DAYTON, OH 45431		
PETER B. LOVERING		
TITLE:		
HEAD UP DISPLAY SYMBOLOGY AND MECHANIZATION STUDY		
TOPIC: 19a	OFFICE: ASD/ENO	

THE MODERN HEAD UP DISPLAY (HUD) IS BEING USED IN A MUCH WIDER RANGE OF MISSIONS AND IN MORE SEGMENTS OF EACH MISSION THAN EVER BEFORE. DISPLAYS THAT, THIRTY YEARS AGO, CONTAINED ONLY BASIC SIGHTING INFORMATION NOW SHOW ATTITUDE, AIRCRAFT PERFORMANCE, NAVIGATION INFORMATION RADAR AND TERRAIN FOLLOWING CUES AND TARGETING DISPLAYS; ALL ON A DISPLAY SURFACE SLIGHTLY LARGER THAN A MODERN ATTITUDE DIRECTOR INDICATOR. TO PUT ALL OF THIS INFORMATION INTO THE HUD REQUIRED NEW SYMBOLOGY, DECLUTTERING SCHEMES AND COMPROMISE. A WHOLE VARIETY OF NEW SYMBOLS HAVE BEEN GIVEN NEW NAMES (SOMETIMES THREE DIFFERENT NAMES) SOME OF WHICH DO NOT ACCURATELY DESCRIBE WHAT THE SYMBOL DOES. AS A CONSEQUENCE, THE NEW SYMBOLS, WITH A PROLIFERATION OF TERMS TO DESCRIBE THEM, PRESENTS A DISPLAY SET, THE USE AND FUNCTION OF WHICH IS NOT INTUITIVELY OBVIOUS. THE OBJECTIVES OF THIS PHASE I EFFORT ARE (1) CONDUCTING A SURVEY OF EXISTING AND EMERGING HUDS TO IDENTIFY CURRENT PROBLEMS WITH TERMINOLOGY, (2) PREPARING A DOCUMENT THAT CORRECTS THESE ISSUES, (3) COORDINATING AND OBTAINING THE CONCURRENCE OF USER FLIGHT CREWS, AND (4) PUBLISHING A DOCUMENT SUITABLE FOR UPDATING HUD SPECIFICATIONS AND SERVING AS A BASIS FOR PREPARING A DETAILED DISPLAY SET DESCRIPTION WITH OPERATING PROCEDURES.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
MILLIMETER WAVE TECHNOLOGY, INC. 770 SPRING STREET, N.W., SUITE 204 ATLANTA, GA 30308 D.J. KOZAKOFF TITLE: 44 GHz LOW NOISE RECEIVER FRONT END TOPIC: 14e OFFICE: SD/YLXT	AF	\$ 44,819

THE OBJECTIVE OF THE PHASE I RESEARCH IS TO STUDY THE DEVELOPMENT OF VARIOUS TYPES OF LOW NOISE 44 GHz RECEIVER FRONT ENDS, AND TO IDENTIFY DEVELOPMENTAL DIFFICULTIES AND TECHNICAL RISKS ASSOCIATED WITH EACH DESIGN. A HIGHLY RELIABLE, SPACE QUANTIFIABLE, LOW NOISE 44 GHz RECEIVER NEEDED. THE STUDY WILL ESTABLISH THE OPTIMUM COURSE TOWARD THE DEVELOPMENT OF THE DESIRED RECEIVER. ONE PRINCIPAL OUTPUT OF THE EFFORT WILL BE THE IDENTIFICATION OF NOVEL APPROACHES TO LOW NOISE RECEPTION AT 44 GHz. NEW AND ADVANTAGEOUS METHODS OF MIXER CONSTRUCTION AND FABRICATION WILL BE DESCRIBED. AT THIS TIME IT APPEARS THAT AN IMAGE REJECT TYPE MIXER CAN BE DEVELOPED WITH A SSB NOISE FIGURE LESS THAN 4.5 dB. PRACTICAL AND THEORETICAL CONSIDERATIONS WILL BE MADE IN ESTABLISHING THE RELATIVE PERFORMANCE POTENTIAL OF BOTH FET AND RF AMPLIFIER FRONT ENDS AND LOW NOISE DOWN CONVERTERS. THE COMPARISON WILL RESULT IN A DECISION AS TO THE BETTER APPROACH.

MISSION RESEARCH CORPORATION 1720 RANDOLPH ROAD, S.E. ALBUQUERQUE, NM 87106 LOUIS BAKER TITLE: REPETITIVE FAST-OPENING SWITCH TOPIC: 8b OFFICE: AFWAL/PRP	AF	\$ 49,794
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WE PROPOSE TO DEVELOP A REPETITIVE, FAST-OPENING SWITCH FOR PULSED-POWER APPLICATIONS EMPLOYING SATURABLE MAGNETIC MATERIALS. THIS TECHNOLOGY HAS PROVEN EFFECTIVE AND RELIABLE IN ELECTRONIC SWITCHING SYSTEMS (ESS) USED IN TELEPHONE EXCHANGES. FOR PHASE I WE WILL DESIGN A

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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PROOF-OF-PRINCIPLE EXPERIMENT; OPTIMIZING THE DESIGN, WHILE TAKING INTO ACCOUNT CONSIDERATIONS OF COST. SUCH A SYSTEM WOULD BE RUGGED, RELIABLE, HIGHLY EFFICIENT, AND WOULD REQUIRE LITTLE OR NO MAINTENANCE.

MISSION RESEARCH CORPORATION	AF	\$ 66,748
1720 RANDOLPH CORPORATION		
ALBUQUERQUE, NM 87106		
DONALD SULLIVAN		
TITLE:		
CAVITY RESONATOR DESIGN FOR THE VIRTUAL CATHODE OSCILLATOR		
(VIRCATOR) MICROWAVE SOURCE		
TOPIC: 8a	OFFICE: AFWL/PRP	

DURING PHASE I MISSION RESEARCH CORPORATION PROPOSES TO PERFORM A STUDY OF THE UTILITY OF CAVITY RESONATORS TO INCREASE THE EFFICIENCY AND MODIFY THE BANDWIDTH OF MICROWAVE EMISSION FROM THE VIRCATOR. THE RESEARCH WILL INCLUDE BOTH A THEORETICAL AND EXPERIMENTAL EFFORT. NUMERICAL SIMULATIONS OF THE CAVITY DESIGN WILL BE CARRIED OUT USING A THREE DIMENSIONAL FULLY RELATIVISTIC AND ELECTROMAGNETIC PARTICLE -IN- CELL PLASMA SIMULATION CODE. THE DESIGN WILL BE IMPLEMENTED ON AN ALREADY EXISTING 100 KV, 20 OHMS, 1 MICROSECOND PULSER. THE PROOF-OF-PRINCIPLE EXPERIMENTS WILL BE LIMITED TO CENTIMETER WAVELENGTHS. THE PROPOSED GOAL IN PHASE I IS TO PRODUCE MEGAWATTS OF RF, SHOW FREQUENCY TUNABILITY BY VARYING ELECTRON BEAM PARAMETERS, AND BANDWIDTH VARIABILITY BY DETUNING THE CAVITY.

MODUS, INC.	AF	\$ 58,946
P.O. BOX 5525		
LITTLE ROCK, AR 72215		
DR. KEITH JONES		
TITLE:		
A MULTI-AXIS GYROSTATIC PICKOFF SENSOR AND INTELLIGENT		
SERVOMECHANISM FOR REAL-TIME MAN-MACHINE INTERFACE CONTROL		
TOPIC: 5	OFFICE: AMD/RDO	

OVER THE LAST TWENTY YEARS THERE HAVE BEEN NUMEROUS NEW INNOVATIONS IN GYROSCOPIC CONTROL MECHANISMS, INCLUDING BOTH ATTITUDE AND RATE GYROS. AN OPPORTUNITY EXISTS WHEREBY STATE-OF-THE-ART IN AUTOPILOT AND ATTITUDE DETERMINATION ON GYROSCOPIC CONTROL TECHNOLOGY CAN BE

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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COMBINED WITH METHODS OF MODELING HUMAN BIOMECHANICS AND PSYCHOMOTOR PROCESSES IN ORDER TO IMPROVE AVAILABLE METHODS OF MAN-MACHINE INTERFACE. SUCH BIO-GYROSCOPIC CONTROL SERVOMECHANISMS CAN BE USED FOR TRAINING AND REFINEMENT OF FINE MOTOR SKILLS; SUPPORTING LIMBS IN UNCOMFORTABLE POSITIONS FOR LONG PERIODS OF TIME WITHOUT FATIGUE AND WITHOUT DEGRADATION IN PERFORMANCE OF FINE MOTOR MOVEMENT; IMPROVED INTERFACE TO ROBOTIC AND BIONIC EXTENSIONS OF HUMAN LIMBS; RECOVERY AND TEMPORARY CORRECTIONAL CONTROL OF AIR OR SPACE CRAFT UNTIL AUTO-PILOTS CAN BE ACTIVATED FOLLOWING A PILOT INJURY; AS A NON-RESTRICTIVE SUPPORT FOR BROKEN OR DAMAGED LIMBS; AND FOR USE IN BETTER MODELING OF HUMAN FACTORS FOR BETTER DESIGN OF MAN-MACHINE INTERFACE CONTROLS.

MSNW, INC. P.O. BOX 865 SAN MARCOS, CA 92069 GEORGE H. REYNOLDS TITLE: JOINING TECHNOLOGY: PREPARATION AND EVALUATION OF REDUCED HEAT INPUT ELECTROSLAG WELDS OF HEAVY-SECTION ALUMINUM ARMOR TOPIC: 70	ARMY	\$ 32,289
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RESEARCH ON AN ULTRAHIGH DEPOSITION RATE, REDUCED HEAT INPUT, SINGLE PASS WELDING PROCESS FOR HEAVY SECTION STEELS IS PROPOSED. THE PROCESS USES METAL POWDER ADDITIONS, IN COMBINATION WITH A CONSUMABLE WELDING ELECTRODE, TO INCREASE THE TOTAL METAL DEPOSITION RATE OF A NARROW GAP ELECTROSLAG WELDING PROCESS, INCREASE WELDING TRAVEL SPEED THEREBY DECREASING PROCESS HEAT INPUT TO THE BASE METAL, AND PROVIDE IMPROVED MATERIAL, A SERIES OF EXPERIMENTAL WELDMENTS WILL BE PREPARED AT INCREASING TOTAL FILLER METAL DEPOSITION RATES AND DECREASING HEAT INPUTS. THESE WELDMENTS WILL BE EVALUATED IN DETAIL TO DETERMINE THE DEGREE OF PROPERTY IMPROVEMENT RELATIVE TO BASELINE CONDITIONS AND RELATIVE TO CONVENTIONAL ELECTROSLAG WELDMENTS. PRELIMINARY ESTIMATES OF FABRICATION COSTS SAVINGS TO BE REALIZED THROUGH INCREASED FILLER METAL DEPOSITION RATE, I.E. INCREASED PRODUCTIVITY, AND DECREASED FILLER METAL COSTS, THROUGH LOW COST METAL POWDER USAGE, WILL BE FORMULATED.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
N.J. DAMASKOS, INC. POST OFFICE BOX 469 CONCORDVILLE, PA 19331 JOHN L. WALLACE TITLE: A NOVEL LOW-COST INFRARED ABSORBING MATERIAL TOPIC: 100 OFFICE: NSSC	NAVY	\$ 48,966

INFRARED ABSORBING COATINGS MAY BE INCOMPATIBLE WITH CERTAIN TYPES OF RADORABSORBING MATERIAL. THE OBJECTIVE OF THIS PROPOSAL IS TO DEVELOP AN EFFECTIVE IR COATING WHICH IS TRANSPARENT TO MICROWAVE ENERGY.

NDX SYSTEMS CORPORATION 1116 LARAMIE STREET MANHATTAN, KS 66502 PAUL S. FISHER TITLE: THE DESIGN OF AN INDEPENDENT, OPERATIONAL, DECISION MAKING CONTROL UNIT FOR AUTOMATIC RECOGNITION TOPIC: 3n OFFICE: DRDEL/CT	ARMY	\$110,034
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IT IS PROPOSED TO INVESTIGATE, BY A SERIES OF EXPERIMENTS THE DESIGN OF A STORAGE AND CONTROL MECHANISM CALLED A RULING. A RULING IS A MATHEMATICAL CONCEPT WHICH LENDS ITSELF TO IMPLEMENTATION ON A CONVENTIONAL COMPUTER. IT IS AN ENVIRONMENT WHICH PERMITS LEARNING IN A REAL-TIME, UNKNOWN ENVIRONMENT, WITH CONTROL BASED ON PAST AND PRESENT LEARNED EXPERIENCE. IN A TYPICAL ENVIRONMENT, A RULING CONSUMING 10 TO THE ELEVENTH POWER BITS IS EQUIVALENT TO A DATA BASE OF 10 TO THE 54TH POWER BITS. UTILIZING A RULING, VAST AMOUNTS OF INFORMATION CAN BE INCORPORATED INTO A RELATIVELY SMALL SYSTEM, PERMITTING THE PERFORMANCE OF ACTIVITIES BASED ON THAT ENORMOUS EXPERIENCE POOL. THIS EFFORT WILL INVOLVE: 1) IMPLEMENTING A RULING ON A COMPUTER, 2) SELECTING AN APPLICATION AREA, 3) DESCRIBING AN ALPHABET REPRESENTING THE ACTIVITIES OF THE APPLICATION, AND THEN 4) BUILDING THE EXPERIENCE POOL. ONCE THE EXPERIENCE POOL IS LARGE ENOUGH TO PERMIT THE CONTROL FUNCTION TO OPERATE, A NEW SET OF UNKNOWN EVENTS WILL BE SUPPLIED. MEASURES OF PERFORMANCE WILL BE GIVEN TO DESCRIBE

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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THE PERFORMANCE IN BOTH THE "LEARNED" AND "UNLEARNED" ENVIRONMENTS. THE OBJECTIVE OF THIS EFFORT IS TO DEMONSTRATE THE APPLICABILITY OF THE PROCESS OF ACCEPTING AND "CONSOLIDATING" INFORMATION INTO A RULING AND THEN THAT INFORMATION TO MAKE DECISIONS BASED ON THAT EXPERIENCE. THIS DEMONSTRATION WILL BE ACCOMPLISHED BY PERFORMING THE EXPERIMENTS IDENTIFIED IN THIS PROPOSAL.

ODYSSEY RESEARCH ASSOCIATES, INC. 609 W. CLINTON STREET ITHACA, NY 14850 DR. RICHARD KITTREDGE TITLE: SUBLANGUAGE TECHNOLOGY APPLIED TO COMMAND AND CONTROL "JARGONS" TOPIC: 2f	ARMY	\$ 94,503
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OFFICE: CDR, CECOM

ORA PROPOSES TO APPLY RECENT ADVANCES TO SUBLANGUAGE RESEARCH TO THE DESCRIPTION OF COMMAND AND CONTROL "JARGONS" FOR DATA BASE QUERY SYSTEMS. AN INITIAL LINGUISTIC STUDY OF SEVERAL JARGONS WILL ALLOW IDENTIFICATION OF THE MOST TRACTABLE SUBLANGUAGES, ONE OF WHICH WILL BE SINGLED OUT TO PLAN A PROTOTYPE SYSTEM. CONSIDERABLE EFFORT WILL BE EXPENDED ON DESCRIBING THE GRAMMER AND LEXICON OF THE SUBLANGUAGE AND ON RELATING THESE TO THE KNOWLEDGE STRUCTURE OF THE ASSOCIATED PROBLEM DOMAIN. THE RESULT OF THE STUDY WILL BE A DETAILED BLUEPRINT FOR A HIGHLY EFFICIENT AND ROBUST QUERY SYSTEM FOR THE CHOSEN DOMAIN. THE SYSTEM MUST BE EFFICIENT ENOUGH TO OPERATE IN REAL TIME AND ROBUST ENOUGH TO OPERATE UNDER THE CONDITIONS OF NOISE AND PARTIAL SIGNAL LOSS WHICH MAY REALISTICALLY BE EXPECTED IN COMMAND AND CONTROL SITUATIONS. CONSIDERATIONS WILL BE GIVEN TO THE TRANSPORTABILITY OF OUR PROTOTYPE TO NEW PROBLEM DOMAINS AND TO THE QUESTION OF PROGRAMMING IN Ada WITH ORIENTATION TOWARD MCF COMPUTERS.

OPHIR CORPORATION 7333 WEST JEFFERSON, SUITE 210 LAKEWOOD, CO 80235 DR. LOREN D. NELSON TITLE: A PASSIVE DEVICE FOR REMOTELY SENSING ATMOSPHERIC PROFILES OF TEMPERATURE, HUMIDITY AND REFRACTIVE INDEX TOPIC: 6	AF	\$ 42,156
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OFFICE: AFGL/XOP

IN THIS PHASE I EFFORT WE PROPOSE TO DEMONSTRATE THE TECHNICAL FEASIBILITY OF A PASSIVE REMOTE SENSING INFRARED DEVICE THAT ACCURATELY AND IN REAL-TIME PROFILES ATMOSPHERIC TEMPERATURE, HUMIDITY, AND REFRACTIVE INDEX. THIS PROPOSED EFFORT IS A LOGICAL EXTENSION OF A PRE-

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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VIOUSLY SUBMITTED THEORETICAL AND NUMERICAL ALGORITHM STUDY WITH THE ARMY RESEARCH OFFICE. SINCE THEIR CHARTER ISF OR BASIC THEORETICAL RESEARCH ONLY, WE ARE PROPOSING A RELATED SBIR EFFORT TO BRING THEORY TO PRACTICE. IN PHASE I WE WILL DEMONSTRATE ENGINEERING FEASIBILITY BY ADAPTING OUR EXISTING RADIOMETER TO RECOVER TEMPERATURE PROFILES IN ACTUAL FIELD CONDITIONS AND THEN DEVELOP AN OPTIMIZED HARDWARE DESIGN FOR PHASE II CONSTRUCTION. IN PHASE II WILL CONSTRUCT A PROTOTYPE, CALIBRATE IT AND TEST IT AT THE 1000 FOOT NOAA BOULDER ATMOSPHERIC OBSERVATORY TOWER.

OPHIR CORPORATION	ARMY	\$ 44,186
240 SOUTH BROADWAY		
DENVER, CO 80209		
DR. LOREN D. NELSON		

TITLE:

AN ALGORITHM FOR A PASSIVE DEVICE FOR REMOTELY SENSING ATMOSPHERIC PROFILES OF TEMPERATURE HUMIDITY AND REFRACTIVE INDEX

TOPIC: 1g OFFICE: ERADCOM

IN THIS PHASE I EFFORT WE PROPOSE TO DEMONSTRATE THE TECHNICAL FEASIBILITY OF A PASSIVE REMOTE SENSING INFRARED DEVICE THAT ACCURATELY AND IN REAL-TIME PROFILES ATMOSPHERIC TEMPERATURE, HUMIDITY, AND REFRACTIVE INDEX.

THIS PROPOSED EFFORT IS A LOGICAL EXTENSION OF A PREVIOUSLY THEORETICAL AND NUMERICAL ALGORITHM STUDY WITH THE ARMY RESEARCH OFFICE. SINCE THEIR CHARTER IS FOR BASIC THEORETICAL RESEARCH ONLY, WE ARE PROPOSING A RELATED SBIR EFFORT TO BRING THEORY TO PRACTICE.

IN PHASE I WE WILL DEVELOP AN ALGORITHM TO BE APPLIED TO OUR EXISTING RADIOMETER TO RECOVER TEMPERATURE PROFILES IN ACTUAL FIELD CONDITIONS.

OPHIR CORPORATION	NAVY	\$ 42,903
733 WEST JEFFERSON AVENUE		
LAKEWOOD, CO 80235		
DR. LOREN D. NELSON		

TITLE:

A DURABLE INFRARED HUMIDITY SENSOR FOR SHIPBOARD

TOPIC: 107 OFFICE: NASC

WE HAVE RECENTLY DEVELOPED A DURABLE INFRARED OPTICAL HUMIDITY SENSOR FOR AIRBORNE IN-CLOUD USE. WE ARE CURRENTLY ADAPTING THIS SENSOR FOR USE IN THE EXTREME PRESSURES AND TEMPERATURES OF PRIMARY COOLANT LOOPS OF GAS-COOLED NUCLEAR REACTORS. IN THIS PROPOSED PHASE I EFFORT WE

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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WILL THEORETICALLY AND EXPERIMENTALLY SHOW THAT IT IS FEASIBLE TO ADAPT OUR EXISTING NON-CONTACT MOISTURE SENSING TECHNOLOGY TO THE HARSH SHIPBOARD MARINE ENVIRONMENT. IN PHASE II WE WILL BUILD A SHIPBOARD PROTOTYPE AND SUBJECT IT TO LABORATORY FIELD, AND SEA TRIALS.

OPHIR CORPORATION & COLORADO INTER. CORP 7333 WEST JEFFERSON AVENUE LAKEWOOD, CO 80235 DR. LOREN D. NELSON TITLE: SHORT-PATH TECHNIQUES FOR DIRECT MEASUREMENT OF ATMOSPHERIC EXTINCTION AND WAVELENGTH DEPENDENT VISIBILITY TOPIC: 105	NAVY	\$ 48,741
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OPTICAL COUNTERMEASURES RESEARCH REQUIRES ACCURATE SHORT-PATH AIRBORNE MEASUREMENT OF WAVELENGTH DEPENDENT ATMOSPHERIC EXTINCTION. THIS ATMOSPHERIC TOTAL EXTINCTION COEFFICIENT HAS AEROSOL ABSORPTION, AEROSOL SCATTERING, AND WATER VAPOR MOLECULAR ABSORPTION COMPONENTS. CURRENT DEVICES MEASURES ONLY MONOCHROMATIC SINGLE-ANGLE AEROSOL SCATTERING COEFFICIENTS. THE DIFFERENCE CAN BE SIGNIFICANT, ESPECIALLY AT LARGER (10-12 MICROMETER) WAVELENGTHS. IN PHASE I WE WILL INVESTIGATE IN-CAVITY LASER EXTINCTIONMETERS AND DUAL-BEAM PHASE LOCKED RATIO METRIC EXTINCTION TECHNIQUES THAT SHOW PROMISE OF MAKING DIRECT SHORT-PATH MEASUREMENTS OF THE TOTAL COMPOSITE ATMOSPHERIC EXTINCTION COEFFICIENT. THIS IS THE QUANTITY OF DIRECT RELEVANCE TO OPTICAL COUNTERMEASURES RESEARCH. IN PHASE II WE WILL CONTRUCT AIRBORNE PROTOTYPES BASED ON THE RESULTS OF THE PHASE I RESEAR^H AND CONDUCT LABORATORY AND AIRBORNE OPTICAL COUNTERMEASURES TEST PROGRAMS IN COLLABORATION WITH TECHNICAL STAFF FROM THE NAVAL AIR SYSTEMS COMMAND.

OPTIMIZATION TECHNOLOGY, INC. 20380 TOWN CENTER LANE, SUITE 160 CUPERTINO, CA 95014 DR ROBERT E. LARSON TITLE: DECENTRALIZED DYNAMIC PROGRAMMING FOR BALLISTIC MISSILE DEFENSE AND OTHER APPLICATIONS TOPIC: 8c	ARMY	\$ 49,616
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THIS PROPOSAL CONSIDERS A NEW APPROACH TO THE DESIGN AND REALTIME CONTROL OF DISTRIBUTED COMPUTER SYSTEMS FOR BALLISTIC MISSILE DEFENSE. THIS APPROACH, CALLED DECENTRALIZED DYNAMIC PROGRAMMING, IS IDEALLY SUITED TO PROBLEMS IN WHICH INFORMATION PROCESSING, AND DECISIONMAKING

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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MUST BE CARRIED OUT AT SEVERAL INTERCONNECTED LOCATIONS, WHERE INFORMATION CAN BE TRANSMITTED BETWEEN THE COMPUTING RESOURCES AVAILABLE AT THE LOCATIONS. THE METHOD IS BASED ON NEW CONCEPTS OF DECENTRALIZED THEORY, AND IT IS APPLICABLE TO DYNAMIC, STOCHASTIC SITUATIONS AS WELL AS TO PURELY STATIC PROBLEMS. THE APPROACH IS BASED ON FORMULATING AN OVERALL OBJECTIVE FUNCTION, WHICH IS TO BE MAXIMIZED, THAT ACCOUNTS FOR THE VARIOUS PRIORITIES OF PERFORMING DIFFERENT TASKS OR FUNCTIONS AT ALL LOCATIONS AS WELL AS THE COSTS FOR COMMUNICATION OR TRANSFER OF RESOURCES OR WORK. THE OBJECTIVE IS THEN MAXIMIZED ACCOUNTING FOR THE REQUIREMENTS AND CAPABILITIES OF EACH LOCATION. A UNIQUE FEATURE OF THE METHOD IS THAT THE MAXIMIZATION IS CARRIED OUT IN A DECENTRALIZED FASHION. EACH LOCATION IS ABLE TO SOLVE THE PORTION OF THE PROBLEM THAT INVOLVES IT. ONLY CERTAIN ESSENTIAL COORDINATION INFORMATION MUST BE TRANSMITTED TO OTHER LOCATIONS. THIS RESULTS IN AN EFFICIENT AND EFFECTIVE PROCEDURE.

OPTRA, INC.	AF	\$ 66,689
1727 REVERE BEACH PKWY		
EVERETT, MA 02149		
DR. MICHAEL HERCHER		
TITLE:		
REMOTE OPTICAL DYNAMIC PRESSURE MEASUREMENT SYSTEM		
TOPIC: 16d	OFFICE: AEDC/DOT	

RESEARCH LEADING TO THE DEVELOPMENT OF A REMOTE OPTICAL DYNAMIC PRESSURE MEASUREMENT SYSTEM IS PROPOSED. THIS INSTRUMENT WOULD CONSIST OF A SMALL PASSIVE TRANSDUCER AT THE POINT OF MEASUREMENT, AND A REMOTELY LOCATED TRANSMIT/RECEIVE UNIT WHICH WOULD INTERROGATE THE TRANSDUCER WITH A LASER BEAM (EITHER DIRECTLY, OR VIA AN OPTICAL FIBER), AND WHICH WOULD DETERMINE THE PRESSURE AT THE TRANSDUCER FROM THE RETURN SIGNAL. NO ELECTRICAL OR OTHER CONNECTION TO THE TRANSDUCER IS REQUIRED. THE PHYSICAL BASIS OF THE TRANSDUCER IS THE DEFORMATION OF A THIN MIRRORED PLATE UNDER THE APPLICATION OF A PRESSURE DIFFERENTIAL. PRELIMINARY MEASUREMENTS INDICATE THAT AN ACCURACY OF BETTER THAN 1 PART IN 1000 SHOULD BE POSSIBLE, WITH MEASUREMENT BANDWIDTHS IN EXCESS OF 20 KHZ. BY MAKING THE TRANSDUCER FROM SAPPHIRE, MEASUREMENT AT TEMPERATURES UP TO 2000 DEG C APPEAR FEASIBLE.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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OPTRA, INC. 1725 REVERE BEACH PKWY. EVERETT, MA 02149 DR MICHAEL HERCHER TITLE: REMOTE OPTICAL NON-DEFORMING LOAD CELL TOPIC: 16a OFFICE: AEDC/DOT	AF	\$ 33,098
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RESEARCH LEADING TO THE DEVELOPMENT OF A REMOTE OPTICAL NON-DEFORMABLE LOAD CELL IS PROPOSED. THIS INSTRUMENT WOULD CONSIST OF A FUZED SILICA LOAD TRANSDUCER, IN CONJUNCTION WITH A 2-FREQUENCY LASER & ASSOCIATED ELECTRONICS. THE PROPOSED TRANSDUCER WOULD BECOME BIREFRINGENT UNDER AN APPLIED LOAD (DUE TO STRESS OPTIC EFFECT), AND THIS BIREFRINGENCE WOULD BE ACCURATELY MEASURED BY THE BEAM FROM A REMOTELY LOCATED 2-FREQUENCY LASER. THE DEFORMATION OF SUCH A TRANSDUCER UNDER LOAD IS EXTREMELY SMALL (E.G. LESS THAN 0.0001 INCHES FOR A 30,000 LB LOAD) READINGS CAN NOT BE MADE WITH PHYSICAL CONNECTION BETWEEN THE TRANSDUCER AND THE MEASUREMENT MODULE OTHER THAN EITHER A LASER BEAM OR AN OPTICAL FIBER. PRELIMINARY MEASUREMENTS INDICATE THAT THIS TYPE OF LOAD CELL WILL BE ACCURATE AND HAVE AN EXTREMELY LARGE DYNAMIC RANGE.

PCP, INC. 2155 INDIAN ROAD WEST PALM BEACH, FL 33409 MARTIN J. COHEN/WERNLUND TITLE: TANDEM ION MOBILITY SPECTROMETER FOR CHEMICAL AGENT DETECTION MONITORING AND ALARM TOPIC: 4a OFFICE: CDR	ARMY	\$ 76,389
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THIS PROPOSAL CONCERNS THE DESIGN, DEVELOPMENT AND TEST OF A NEW INSTRUMENT FOR THE POINT DETECTION, MONITORING AND ALARM OF CHEMICAL AGENTS UNDER BATTLEFIELD CONDITIONS. THIS NEW INSTRUMENT IS THE TANDEM ION MOBILITY SPECTROMETER WHICH IS A DUAL ION MOBILITY SPECTRO-

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>METER. THE CONVENTIONAL IMS IS AT PRESENT UNDER DEVELOPMENT BY THE DOD THIS PROJECT WILL RESULT IN IMPROVEMENTS IN THE ABILITY OF ION MOBILITY INSTRUMENTATION TO DISTINGUISH CHEMICAL AGENT MATERIALS FROM OTHER NON-AGENT MATERIALS. AT PARTS-PER-BILLION CONCENTRATION LEVELS IN AIR. THIS REDUCTION IN INTERFERENCE UNDER BATTLEFIELD CONDITIONS WILL ARISE FROM AN IMPROVEMENT IN RESOLUTION AND SELECTIVE AND TARGETED CHARGING OF THE AGENT CHEMICALS. IN PHASE I THE TIMS INSTRUMENT IS TO BE DESIGNED, BUILT AND TESTED USING SELECTED REAGENTS AND SIMULANTS FOR CHEMICAL AGENTS. CHEMICAL AGENTS ARE ELECTRICALLY CHARGED BY THE ION-MOLECULE REACTION PROCESS USING IONIZATION POTENTIAL, PROTON(OR ELECTRON) AFFINITY AND ADDUCT ION FORMATION SELECTIVITY. THE TIMS RESEARCH INSTRUMENT IS COUPLED TO AN EXISTING QUADRUPOLE MASS SPECTROMETER TO OBTAIN MASS IDENTIFIED ION INFORMATION.</p>		

PDA ENGINEERING 1560 BROOKHOLLOW DRIVING SANTA ANA, CA 92705 JAMES ELLIOTT DUNN TITLE: HEAT TRANSFER AND PRESSURE DATA ON WIND TUNNEL MODELS WITH SINGLE-HOLE, STAGNATION-POINT, MASS INJECTION FROM ZERO TO 20 DEGREE AOA TOPIC:	AF	\$ 50,000
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OFFICE: BMO/PMX

MEASUREMENTS OF TEMPERATURE AND PRESSURE HAVE BEEN MADE ON TWO MODELS WITH STAGNATION-POINT, SINGLE-HOLE, MASS INJECTION RATIOS FROM ZERO TO 99 AND AT 0, 5, 10, AND 20 DEGREES ANGLE-OF-ATTACK IN THE NASA LANGLEY 8' HIGH-TEMPERATURE-STRUCTURES-TUNNEL. THESE RAW-DATA HAVE NOT BEEN REDUCED TO NONDIMENSIONAL PAID-MECHANIC SIMILARITY PARAMETERS SO THAT THE DATA CAN BE USED FOR DESIGN PURPOSES IN THE GENERAL ICBM REENTRY ENVIRONMENT. THE PROPOSAL HEREIN IS TO REDUCE THE AVAILABLE TEST DATA TO STANTON NUMBER, COOLANT-EFFICIENCY, PRESURE COEFFICIENT AND OTHER RELEVANT SIMILARITY PARAMETERS SO THAT DESIGNERS AND ANALYSTS CAN USE THE TEST RESULTS TO DESIGN GAS-COOLED TUNGSTEN NON-SETIPS FOR BRV'S, AND POSSIBLY SATELLITE REENTRY VEHICLES.

PDA ENGINEERING 1560 BROOKHOLLOW DRIVE SANTA ANA, CA 92705 ROBERT G. OEDING TITLE: TRACK G EROSION DATA APPLICATION ANALYSIS TOPIC: 18	AF	\$ 49,992
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OFFICE: BMO/PMX

THE EFFECTIVE UTILIZATION OF THE AEDC TRACK G FACILITY TO EVALUATE THE EROSION PERFORMANCE OF REENTRY VEHICLE NOSETIP MATERIALS IN WEATHER ENVIRONMENTS HAS BEEN LIMITED BY A LACK OF INSIGHT INTO PHYSICAL PHENOMENA PECULIAR TO TRACK TESTING. THE PURPOSE OF THE PROPOSED

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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INVESTIGATION IS TO ANALYSE AND MODEL THE IMPORTANT TRACK G EROSION PHENOMENA. THE EFFORT IS DIRECTED TOWARD QUANTIFYING PHENOMENOLOGY EFFECTS ON EROSION MEASUREMENTS AND ON DEVELOPING A METHODOLOGY TO RELATE TRACK G DATA TO THE PREDICTION OF MATERIAL PERFORMANCE IN FLIGHT ENVIRONMENTS.

PDA ENGINEERING 1560 BROOKHOLLOW DRIVE SANTA ANA, CA 92705 LIAM GROENER TITLE: THERMAL ANALYSIS OF TRACK G DATA TOPIC: 18	AF	\$ 49,986
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OFFICE: BMO/PMX

CARBON ABLATION DATA OBTAINED IN HIGH PRESSURE ABLATION TESTS (AEDC TRACK G) WILL BE CORRELATED WITH THEORY, INCLUDING POSSIBLE EFFECTS OF MELTING. THE UNCERTAINTIES IN THE ABLATION THEORY THAT ARE CONSISTENT WITH THE GROUND TEST DATA WILL BE DEFINED. THE RESULTS WILL THEN BE USED TO PREDICT THE UNCERTAINTY TO BE EXPECTED IN AN IMPACTOR TECHNOLOGY PROGRAM (ITP) PASSIVE NOSETIP FLIGHT.

PL ENGINEERING 1560 BROOKHOLLOW DRIVE SANTA ANA, CA 92705 HENRY MOODY TITLE: ADVANCED ANTENNA WINDOW PERFORMANCE AND REQUIREMENT DEFINITION TOPIC: 18a	AF	\$ 49,996
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OFFICE: BMO/PMX

ANTENNA WINDOWS CRITICALLY AFFECT THE PERFORMANCE OF ADVANCED REENTRY SYSTEMS. IN MANY CASES COMPROMISES IN VEHICLE EFFECTIVENESS MUST BE MADE BECAUSE OF WINDOW MATERIAL LIMITATIONS. TO AID IN THE IMPROVEMENT OF WINDOW, AND THEREFORE OVERALL PERFORMANCE, AN ANALYSIS STUDY IS PROPOSED TO (1) EVALUATE THE PERFORMANCE OF CANDIDATE AIR FORCE WINDOW MATERIALS IN A SYSTEM THAT IS TO BE DEPLOYED IN THE NEAR FUTURE, AND (2) IDENTIFY MATERIAL AND/OR DESIGN AREAS THAT WOULD ENHANCE WINDOW, AND THEREFORE VEHICLE EFFECTIVENESS. THE PROPOSED PLAN IS TO PERFORM

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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THERMAL AND ABLATION ANALYSES ON THREE ANTENNA WINDOW MATERIALS THAT WERE RECENTLY FLIGHT TESTED. THESE ANALYSIS METHODS WILL THEN BE USED TO EVALUATE WINDOW RESPONSE IN THE OVERALL SYSTEM PERFORMANCE ENVELOP. ONE THREE-DIMENSIONAL FINITE ELEMENT ANALYSIS WILL BE PERFORMED TO DETERMINE THE DYNAMIC RESPONSE OF A SINGLE ANTENNA WINDOW AND SURROUNDING VEHICLE SHELL IN A SPECIFIED NUCLEAR ATTACK ENVIRONMENT.

PHOTOFABRICATION TECHNOLOGY, INC.	AF	\$ 47,027
PO BOX 3209		
DERRY, NH 03038		
R.E. HOWE		
TITLE:		
LOW COST ATMOSPHERIC CORROSION SENSORS		
TOPIC: 11e	OFFICE: AFWAL/XRPM	

THIS PROPOSAL ENVISIONS DETERMINING THE FEASIBILITY OF USING PHOTO-FABRICATION TECHNOLOGY TO PRODUCE LOW COST ATMOSPHERIC CORROSION SENSORS. UNLIKE CONVENTIONAL ATMOSPHERIC CORROSION SENSORS WHICH MEASURE ONLY INSTANTANEOUS CORROSION RATE, THE PROPOSED SENSORS WILL MEASURE BOTH INSTANTANEOUS AND TIME-AVERAGED CORROSION RATE. THE TENTATIVE DESIGN OF THESE SENSORS IS VERY COMPACT, ABOUT THE SIZE OF A POSTAGE STAMP. THE RESEARCH PROPOSED HEREIN COVERS BOTH THE DESIGN AND PROOF OF CONCEPT TESTING OF THE PROPOSED SENSORS. METALS TO BE INVESTIGATED INCLUDE HIGH STRENGTH STEEL, 1100 ALUMINUM, 7XXX ALUMINUM AND ZINC.

PHYSICAL ACOUSTICS CORPORATION	AF	\$ 49,125
743 ALEXANDER ROAD		
PRINCETON, NJ 08540		
JOHN M. CARLYLE, PHD.		
TITLE:		
IN-PROCESS MACHINING QUALITY ASSURANCE INSTRUMENT		
TOPIC: 11i	OFFICE: AFWAL/XRPM	

A PROJECT TO DEVELOP AN INSTRUMENT THAT WILL DETECT TOOL WEAR, LUBRICATION FAILURE AND PRODUCT DEFECTS AUTOMATED MACHINING IS PROPOSED. THE INSTRUMENT WOULD CONTINUOUSLY MONITOR AUTOMATED METALWORKING ON LATHES, MILLING MACHINES, DRILL PRESSES AND PUNCH PRESSES, AND WOULD

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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BE CAPABLE OF SELF-OPTIMIZING ADAPTIVE MACHINING CONTROL. A THEORETICAL BACKGROUND IS PROVIDED WHICH INDICATES THAT TOOL WEAR, LUBRICATION FAILURE AND PRODUCT DEFECTS CAN BE IDENTIFIED BY MEANS OF CHARACTERISTIC FREQUENCIES EMITTED IN THE ULTRASONIC RANGE. EXPERIMENTS ARE PROPOSED TO CONFIRM THE THEORY ESTABLISH THE LABORATORY FEASIBILITY OF THE CONCEPT AND DEFINE THE OPERATING REGIME AND SIGNAL PROCESSING CHARACTERISTICS OF SUCH AN INSTRUMENT SO THAT A PROTOTYPE COULD BE CONSTRUCTED.

PHYSICAL DYNAMICS, INC. 300 120TH AVE. NE. BLDG. 7, SUITE 220 BELLEVUE, WA 98005 DONALD P. DELISI TITLE: AN EXPERIMENTAL AND NUMERICAL STUDY OF VORTICES IN A STRATIFIED SHEAR FLOW TOPIC: 123	NAVY	\$ 91,983
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THIS PROPOSAL ADDRESSES THE PROPAGATION, PERSISTENCE, AND FATE OF A VORTEX PAIR IN A STRATIFIED, SHEARED ENVIRONMENT. IN PARTICULAR, WE WILL STUDY THE EVOLUTION OF A SOLITARY VORTEX WHICH OCCURS WHEN A VORTEX PAIR IS IMBEDDED IN SHEAR FLOW OF PROPER MAGNITUDE. SOLITARY WAVES HAVE BEEN OBSERVED TO EVOLVE IN THE ATMOSPHERE BEHIND AIRCRAFT, BUT NO SYSTEMATIC, CONTROLLED LABORATORY OR THEORETICAL STUDIES HAVE BEEN PERFORMED TO DATE. THE OBJECTIVES OF THE PHASE I STUDY ARE TO DETERMINE WHETHER SOLITARY VORTICES CAN BE REPRODUCED IN THE LABORATORY (AS PREDICTED BY OUR NUMERICAL CODE) AND IF MEASUREMENTS CAN BE MADE OF SUFFICIENT QUALITY TO BE COMPARED TO THE NUMERICAL PREDICTIONS THE GOAL IS TO PRODUCE A SET OF EXPERIMENTAL MEASUREMENTS THAT CAN BE USED TO VALIDATE EXISTING OR FUTURE NUMERICAL OR THEORETICAL MODELS, AND TO GAIN A BETTER UNDERSTANDING OF VORTEX FLOWS IN REALISTIC ENVIRONMENTS. THE MAJORITY OF THE PHASE I EFFORT WILL BE TO CONSTRUCT AN EXPERIMENTAL FACILITY TO DETERMINE WHETHER VORTICES IN A STRATIFIED SHEARED ENVIRONMENT CAN BE PRODUCED IN THE LABORATORY. WE WILL USE THE NUMERICAL CODE PREDICTIONS TO HELP DESIGN THE FACILITY AND FLOW CONDITIONS. EXPERIMENTS WILL BE PERFORMED AND THE RESULTS COMPARED TO THE CODE PREDICTIONS.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
PHYSICAL DYNAMICS, INC. POST OFFICE BOX 1883 LA JOLLA, CA 92038 WALTER PODNEY TITLE: ELECTROMAGNETIC DETECTION OF BURIED MINES USING A SUPERCONDUCTIVE MAGNETIC GRADIOMETER TOPIC: 2 OFFICE: NSSC	NAVY	\$143,938

MINES BURIED IN THE SEA BOTTOM ARE OFTEN IMPOSSIBLE TO DETECT ACOUSTICALLY. ELECTROMAGNETIC ENERGY PROVIDES AN ALTERNATIVE MEANS OF DETECTION. AN ACTIVE SYSTEM FORMED BY A SOURCE CURRENT ENCIRCLING A SUPERCONDUCTIVE MAGNETIC GRADIOMETER HOLDS THE PROMISE OF PROVIDING AN UNDERWATER-TOWED SYSTEM FOR DETECTING BURIED MINES ELECTROMAGNETICALLY. THE SOURCE CAN OPERATE AT FREQUENCIES OF A FEW TENS OF HERTZ, WHICH ARE LOW ENOUGH TO PENETRATE SEAWATER EFFECTIVELY BUT HIGH ENOUGH TO EXCITE SENSIBLE EDDY CURRENTS IN METALLIC TARGETS. THEY ALSO ARE HIGHER THAN FREQUENCIES OF NOISE ARISING FROM SEAWATER MOTIONS AND TOWED BODY OSCILLATIONS. FIRST ESTIMATES SHOW THAT USEFUL DETECTION RANGES, ~15 m, CAN BE ATTAINED FOR PRACTICAL SOURCE MOMENTS, ~104A M². WE PROPOSE FIELD MEASUREMENTS TO EVALUATE THE FEASIBILITY OF OPERATING A SUPERCONDUCTIVE GRADIOMETER WITHIN AN ENCIRCLING CURRENT AND TO DETERMINE THE EXPECTED IDEAL PERFORMANCE OF THE SYSTEM.

PHYSICAL SCIENCES, INC. RESEARCH PARK P.O. BOX 3100 ANDOVER, MA 01810 DR. ALAN GELB TITLE: THE USE OF LIQUID FILMS FOR SPACECRAFT SURVIVABILITY TO LASER RADIATION TOPIC: 1c OFFICE: AFOSR/XOT	AF	\$ 49,690
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THE CONCEPT OF LIQUID FILM MEDIATED LASER PROTECTION WILL BE INVESTIGATED FOR TUNGSTENCOATED CARBON SURFACES. A COMBINED THEORETICAL-EXPERIMENTAL PROGRAM IS PROPOSED. THE THEORETICAL EFFORT WILL DETERMINE RANGES OF STABILITY FOR LIQUID FILMS UNDER CW LASER INTERACTION CONDITIONS. FILM FAILURE MECHANISMS WILL BE DEVELOPED FOR TUNGSTENCOATED CARBON AND OTHER CANDIDATE MATERIALS WILL BE IDENTIFIED. THE EXPERIMENTAL PORTION OF THIS PROGRAM WILL DETERMINE FILM STABILITY STABLE VAPORIZATION PRODUCTS AND HEATS OF VAPORIZATION FOR TUNGSTEN-

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>COATED CARBON. MEASUREMENTS WILL BE PERFORMED FOR SEVERAL FILM THICK- NESS BY E-BEAM HEATING AT ENERGY DEPOSITION RATES SIMILAR TO CW LASER CONDITIONS.</p>		
PINNACLE RESEARCH INSTITUTE, INC. 10432 N. TANTAU AVENUE CUPERTINO, CA 95014 R. S. YEO TITLE: EVALUATION OF THE ULTRACAPACITOR FOR BALLISTIC MISSILE DEFENSE APPLICATIONS TOPIC: 8d	ARMY	\$ 49,618
<p>OFFICE: BMDSC-CPP</p>		

ELECTROMAGNETIC GUNS CAN BE USED FOR BALLISTIC MISSILE DEFENSE (BMD) SYSTEMS, BUT REQUIRE VERY LARGE ENERGY LEVELS THAT CAN BE PULSED REPEATEDLY MANY TIMES A SECOND. POWER SOURCES THAT CAN MEET THOSE REQUIREMENTS ARE RARE AND MUST BE AVAILABLE AT RELATIVELY LOW COST. BATTERIES CAN STORE A LARGE AMOUNT OF ENERGY, BUT CANNOT DISCHARGE AT A HIGH ENOUGH RATE FOR THIS APPLICATION. ON THE OTHER HAND, CONVENTIONAL ELECTROLYTIC CAPACITORS ARE CAPABLE OF DELIVERING HIGH RATE DISCHARGES, BUT THE AMOUNT OF STORED ENERGY IS EXTREMELY LOW. THE MAIN OBJECTIVE OF PHASE I OF THIS PROPOSED PROGRAM IS TO DEMONSTRATE THE FEASIBILITY OF A HIGH RATE, LONG SHELF LIFE ULTRACAPACITOR AS A POWER SOURCE FOR APPLICATIONS SUCH AS ELECTROMAGNETIC GUNS.

PINSON ASSOCIATES, INC. P.O. BOX 9648 AUSTIN, TX 78766 A. WAYNE SEFCIK TITLE: IMPROVED RADAR TRACKING AGAINST CHAFF COUNTERMEASURES TOPIC: 3i	ARMY	\$ 48,689
OFFICE: ERADCOM		

THIS PROPOSED PROGRAM IS TO INVESTIGATE THE FEASIBILITY OF USING UNIQUE FILTERING TECHNIQUES TO PROCESS PULSE-TO-PULSE RCS AND PHASE DATA TO TRACK AN AIR VEHICLE IN THE PRESENCE OF CHAFF. THE PROPOSED TECHNIQUES WOULD PERMIT TRACKING THE AIRCRAFT WITH OR WITHOUT THE

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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PRESENCE OF CHAFF. IT IS ANTICIPATED THAT THIS INSTRUMENTATION COULD BE ADDED TO ANY COHERENT OR SEMI-COHERENT RADAR AND BE FAR SUPERIOR TO THE PRESENT MTI AND OTHER ANTI-CLUTTER TECHNIQUES. THE FEASIBILITY WILL BE INVESTIGATED BY USING ACTUAL PULSE-TO-PULSE RCS AND PHASE DATA COLLECTED IN THE TRIAL MACE III PROGRAM IN 1982 WHEREIN LARGE AMOUNTS OF DATA WERE COLLECTED ON FIVE TYPES OF HELICOPTERS AND 15 TYPES OF FIXED WING AIRCRAFT.

PLANNING SYSTEMS INC. 7900 WESTPARK DRIVE, SUITE 600 MECLEAN, VA 22102 BURLIE BRUNSON TITLE: DETECTION/NEUTRALIZATION OF BURIED MINES: PHYSICAL PROPERTIES FROM ACOUSTIC REFLECTIVITY TOPIC: 2	NAVY	\$ 49,089
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AREAS OF THE OCEAN FLOOR DISPOSED TO MINE BURIAL HAVE SOFT SEDIMENTS (i.e., LOW SHEAR STRENGTH) OR SANDY SEDIMENTS SUBJECT TO SCOUR. KNOWLEDGE OF SEAFLOOR SHEAR STRENGTH, POROSITY, AND GRAIN SIZE WOULD AID THE HUNT FOR BURIED MINES. NORMAL INCIDENCE, ACOUSTIC ECHO SOUNDERS ARE BEING DEVELOPED TO INFER SUCH PHYSICAL PROPERTIES OF THE SEDIMENT. PSI PROPOSES TO EVALUATE THE POTENTIAL FOR SUCCESS OF THESE SYSTEMS THROUGH THE USE OF A THEORETICAL PHYSICAL SEDIMENT MODEL. PSI WILL SHOW THE SENSITIVITY OF THE REFLECTION COEFFICIENT TO PHYSICAL PROPERTIES IN REALISTIC SEDIMENTS FOR SANDS, SILTS, AND CLAYS EACH TIED TO CORE OBSERVATIONS. WAYS OF DISCRIMINATING BETWEEN THE PHYSICAL CAUSES WILL BE INVESTIGATED.

PLANNING SYSTEMS INC. 7900 WESTPARK DRIVE, SUITE 600 MCLEAN, VA 22102 STEPHEN SCHIFF TITLE: ACOUSTIC COMMUNICATIONS TOPIC: 84	NAVY	\$ 49,079
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VOICE IS A HIGH PRIORITY COMMUNICATIONS FORMAT EVERYWHERE IN THE MILITARY EXCEPT UNDER THE OCEAN, AND THUS RESEARCH TO DEVELOP AND DETERMINE THE FEASIBILITY OF IMPROVED VOICE COMMUNICATIONS TO SUBMERGED SUBMARINES IS TIMELY AND IMPORTANT. THE CURRENT VOICE

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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UNDERWATER COMMUNICATIONS SYSTEM OFFERS ONLY MODEST PERFORMANCE. THE PRINCIPAL REASON FOR THIS IS THAT ITS MODULATION TECHNIQUE WAS BORROWED FROM RADIO WITH LITTLE ATTENTION GIVEN TO MATCHING THE SIGNAL TO THE UNDERWATER ENVIRONMENT. THERE IS REASON TO BELIEVE, HOWEVER, THAT PROPERLY TRANSFORMED SPEECH COULD BE A ROBUST AND RELIABLE ACOUSTIC COMMUNICATIONS SIGNAL. IT IS PROPOSED TO ESTABLISH THE TECHNICAL MERIT AND FEASIBILITY FOR SIX TRANSFORMED SPEECH TECHNIQUES: TIME STRETCHED; TIME STRETCHED FREQUENCY STACKED; TIME REVERSED; TIME REVERSED AND STRETCHED; PALINDROMIC; AND ANALOG VOCODED. THESE ARE DESIGNED TO MINIMIZE THE EFFECTS OF TEMPORAL DISTORTIONS IMPOSED BY THE MEDIUM, AND TO PRESERVE THE REDUNDANCY AND DETAILED ENCODING OF SPOKEN LANGUAGE. THIS RESEARCH WILL BE ACCOMPLISHED USING THE RESULTS OF RECENT ADVANCES IN MULTIPATH CHANNEL CHARACTERIZATION AND A NEW SPEECH INTELLIGIBILITY TEST WHICH IS APPLICABLE TO THE MULTIPATH PROBLEM.

POLYTRONIX, INC.
1820 N. GLENVILLE AVE., SUITE 116
RICHARDSON, TX 75081
WALTER Y. WEN

DARPA \$ 41,345

TITLE:
NEW DISPLAY TECHNOLOGY
TOPIC: 3 OFFICE: DARPA

A RESEARCH AND DEVELOPMENT PROJECT IS PROPOSED TO DEVELOP MATERIALS FOR PACKAGING LIQUID CRYSTAL DISPLAYS (LCDS) USING PLASTIC SUBSTRATES. THE PLASTIC LCD TECHNOLOGY WILL MEET THE DOD'S NEED OF DISPLAYS RANGING FROM HAND HELD TO BLACKBOARD SIZE. THE KEY TECHNOLOGY IS SELECTION OF PLASTIC SUBSTRATES AND DEVELOPMENT OF A LOW TEMPERATURE DEPOSITION METHOD FOR A TRANSPARENT CONDUCTIVE THIN FILM ON THE PLASTIC SUBSTRATES. THE SUCCESS OF DEVELOPMENT OF THIS TECHNOLOGY WILL ALLOW THE FABRICATION OF A PLASTIC LCD WITH HIGH IMPACT RESISTANCE, ENHANCED VIEWING CHARACTERISTICS, REDUCED WEIGHT, AND HIGH RELIABILITY. CHEMISTRY AND MATERIAL RESEARCH SHALL FOCUS ON SURFACE ACTIVE AGENTS, TOPCOATS, AND SURFACE TREATMENT TO PROMOTE ADHESION AT THE INTERFACE OF TRANSPARENT CONDUCTIVE FILM AND THE PLASTIC SUBSTRATES.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
POWERTRONIC SYSTEMS, INC. POST OFFICE BOX 29109 NEW ORLEANS, LA 70189 CHARLES E. THOMAS TITLE: LOW-HARMONIC 400 HZ LINE VOLTAGE REGULATOR FOR SHIPBOARD POWER-SYSTEMS TOPIC: 52	NAVY	\$ 70,870

OFFICE: NSSC

DEVELOPMENT IS PROPOSED OF AN IMPROVED TYPE OF 400 HZ LINE VOLTAGE REGULATOR (LVR) THAT INHERENTLY PROVIDES LOW-DISTORTION OUTPUT VOLTAGE WITH NON-LINEAR LOADS AND WITH DISTORTED INPUT VOLTAGE. REGULATION IS ACCOMPLISHED BY ALTERNATELY SWITCHING AT HIGH FREQUENCY CIRCUITS. PHASE I OBJECTIVES ARE DESIGN, FABRICATION AND TESTING OF A BREADBOARD VLR THAN DEMONSTRATES THE CAPABILITY TO SUPPLY LOW-DISTORTION OUTPUT WITH NON-LINEAR LOADS AND WITH DISTORTED INPUT VOLTAGE. THE BREADBOARD VLR WILL CONSIST OF AN EXISTING 60 HZ LVR WITH MODIFICATIONS REQUIRED TO ENABLE OPERATION AT HIGHER SWITCHING AND POWER FREQUENCIES.

PRACTICAL DESIGN LABS FOR ELECTRONICS 21 ATHERTON AVENUE NASHUA, NH 03060 JOHN H. WILLIAMS TITLE: INTELLIGENT MANUFACTURING MACHINES FOR THE ASSEMBLY OF SURFACE MOUNT TECHNOLOGY TOPIC: 11i	AF	\$ 47,800
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OFFICE: AFWAL/XRPM

THE PROBLEM PROPOSED IN THIS PROPOSAL IS THE WIDENING GAP BETWEEN EMERGING ELECTRONICS R&D AND AMERICAN MANUFACTURERS ABILITY TO EFFECTIVELY PRODUCE THE NEXT GENERATION OF PRINTED WIRING ASSEMBLIES. AN OPPORTUNITY CURRENTLY EXISTS TO INITIATE LONG TERM SOLUTIONS FOR IMPROVING OUR MANUFACTURING TECHNOLOGIES BY USING THE LATEST GENERATION OF COMPUTERS, VISION SYSTEMS, AND MECHANICS TO PROVIDE AN INTELLIGENT MANUFACTURING MACHINE (IMM) FOR THE PRODUCTION OF PRINTED WIRING ASSEMBLIES (PWA'S) BASED ON SURFACE MOUNT TECHNOLOGIES (SMT). OUR OBJECTIVES ARE TO PRODUCE A COST EFFECTIVE IMM TO MEET THE NEEDS OF THE ORIGINAL EQUIPMENT MANUFACTURERS (OEM) IN THE SMT AREA. SOME OF THE INNOVATIONS INCORPORATED IN THE IMM WOULD BE THE APPLICATION OF A FRESH APPROACH TO ROBOTICS AND STATE OF THE ART (SOA) VISION SYSTEMS.

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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EACH OF THESE AREAS COUPLED WITH THE LATEST GENERATION OF COMPTERS AND SENSORS WILL MAKE A MORE POWERFULL SYSTEMS IMPLEMENTATION POSSIBLE. THE PHASE I EXPLORATORY DEVELOPMENT WILL FOCUS ON THOSE ISSUES WHICH CLOSELY EFFECT THE IMPLEMENTATION OF SMT. THEY ARE; (A) THE SENSORY AND CONTROL ELEMENTS REQUIRED TO EXECUTE HIGH PRECISION ASSEMBLY (B) THE PWA REQUIREMENTS IN 3-5 YEARS.

PROBE SYSTEMS, INC.
655 NORTH PASTORIA AVENUE
SUNNYVALE, CA 94086
DR. JERRY L. ERICKSON

ARMY \$104,704

TITLE:

LINEAR ACOUSTO-OPTIC FILTERS APPLIED TO BROADBAND ELECTRONIC RECEIVER SYSTEMS

TOPIC: 1n

OFFICE: ERADCOM

A NEW CLASS OF LINEAR FILTERS IS EMERGING WHICH UTILIZE ACOUSTO-OPTIC TECHNOLOGY TO PROVIDE PROGRAMMABLE OR ADAPTIVE, HIGH-Q, LINEAR FILTERING OF BROADBAND (20-2000 MHZ) ELECTRONIC SIGNALS. THESE HIGH DYNAMIC RANGE FILTERS CAN BE PROGRAMMED OR ADAPTED DIRECTLY IN THE FREQUENCY DOMAIN. RECENT (1983) EXPERIMENTS BY PROBE SYSTEMS HAVE SHOWN THAT THIS FILTER TECHNOLOGY CAN RAPIDLY AND SELF-ADAPTIVELY REJECT MULTIPLE NARROWBAND JAMMER SIGNALS FROM BROADBAND SIGNALS WITH EXTREMELY NARROW DEEP, LINEAR-PHASE NOTCH FILTERS. APPLICATIONS INCLUDE SIGNAL INTERFERENCE OR JAMMER REJECTION FOR BROADBAND SURVEILLANCE, WARNING, AND DIRECTION FINDING RECEIVERS AS WELL AS SPREAD SPECTRUM COMMUNICATION AND RADAR SYSTEMS DESIGNED TO OPERATE IN HIGH INTERFERENCE ENVIRONMENTS. THE PROPOSED EFFORT WOULD INVOLVE ANALYZING THE POTENTIAL PERFORMANCE AND COST IMPROVEMENTS WHICH THIS NEW LINEAR ACOUSTO-OPTIC FILTER TECHNOLOGY COULD PROVIDE WHEN APPLIED TO BROADBAND ELECTRONIC SURVEILLANCE AND WARNING RECEIVERS AS WELL AS SPREAD SPECTRUM COMMUNICATION AND RADAR SYSTEMS. THESE PERFORMANCE AND COST IMPROVEMENTS WOULD BE COMPARED TO ALTERNATE CURRENT AND FUTURE TECHNOLOGIES. ALSO, POSSIBLE TECHNOLOGY GAP AREAS FOR FABRICATING THE FILTERS WOULD BE IDENTIFIED.

PULSE SCIENCES, INC.
14796 WICKS BLVD.
SANLEANDRO, CA 94577
LELAND SCHLITT

AF \$ 69,499

TITLE:

THE SCANTRON--A HIGH POWER MICROWAVE GENERATOR CONCEPT

TOPIC: 8a

OFFICE: AFWL/PRP

LOW VOLTAGE KLYSTRONS ARE RELIABLE AND EFFICIENT (GREATER THAN 30 PERCENT) MICROWAVE AMPLIFIERS, BUT ARE LIMITED TO POWER LEVELS OF 10-20 MW AND ARE DIFFICULT TO SCALE TO HIGHER VOLTAGE DUE TO THE INCREASING SCALE LENGTH FOR LONGITUDINAL BEAM BUNCHING. WE PROPOSE HERE THE

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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DEVELOPMENT OF THE SCANTRON WHICH PRESERVES MANY OF THE ATTRACTIVE FEATURES OF KLYSTRON BUT WHICH CAN BE DRIVEN BY HIGH VOLTAGE, RELATIVISTIC, ELECTRON BEAMS. OUTPUT POWER OF SUCH DEVICES ARE PROJECTED TO APPROACH 1 GW IN THE FREQUENCY RANGE 100 MHZ TO A FEW GHZ. THE SCANTRON COUPLES THE TECHNOLOGY OF SHORT PULSE, HIGH VOLTAGE PULSED POWER GENERATION WITH A NEW METHOD TO COUPLE LONGITUDINAL ENERGY IN RF OSCILLATIONS IN A MULTI-CAVITY EXTRACTOR THROUGH SPATIAL SCANNING. A 1 MV DESIGN IS ESTIMATED TO GIVE AN OUTPUT POWER GREATER THAN 0.3 GW MODULE AT 2GHZ. EXTENSION OF THE DEVICE TO A MULTIMODULE DESIGN WITH A SINGLE PULSED POWER GENERATOR WILL ALLOW SCALING TO GREATER THAN 10 GW WITH PULSE LENGTHS AS LONG AS 1 MICROSECOND. PHASE I WILL ENCOMPASS ANALYSIS OF THE PULSED POWER DRIVER AND SCANTRON AND DESIGN OF A 0.3 GW DEMONSTRATION SYSTEM.

Q-DOT, INC. 1001 E TOUHY, SUITE 125 DES PLAINES, IL 60018 THOMAS E. LINNENBRINK TITLE: ASSESSMENT OF CCD-BASED TRANSIENT WAVEFORM RECORDING FOR dc - 20GHz Q-DOT RESEARCH PROPOSAL 1035, PART 1--TECHNICAL PROPOSAL TOPIC: 4	DNA	\$ 48,339
OFFICE: DDST		

UNIQUE CHARGE-COUPLED DEVICES MAY BE ABLE TO RECORD PHENOMENA WITH INFORMATION SPANNING dc - 20GHz. DATA TO BE RECORDED IS SAMPLED AT RATES UP TO 100 Gs/s AND STORED TEMPORARILY IN THE CCD. IT IS THEN SHIFTED AT SLOW RATES INTO A CONVENTIONAL a/d AND DIGITAL MEMORY. PRELIMINARY RESEARCH SUGGESTS BROAD TRADE-OFFS AMONG RECORD LENGTH, SAMPLING INTERVAL, DYNAMIC RANGE, AND OTHER FACTORS. OUR FIRST STEP WILL BE TO ASSESS DNA'S NEEDS AND DEVELOP DETAILED TARGET SPECIFICATIONS FOR THE REQUIRED EQUIPMENT. THEN, A SET OF CANDIDATE CCD STRUCTURES AND SUPPORT ELEMENTS WILL BE CONFIRMED.

QUANTIC INDUSTRIES, INC. 990 COMMERCIAL STREET SAN CARLOS, CA 94070 WILLIAM F. MARSHALL TITLE: PROPOSAL FOR A SEMICONDUCTOR-TRIGGERED HIGH VOLTAGE SWITCH TOPIC: 7b	AF	\$ 67,000
OFFICE: AD/DXB		

A RELIABLE, FAST, INEXPENSIVE HIGH-VOLTAGE SEMICONDUCTOR TRIGGERED SWITCH IS NEEDED TO INITIATE EXPLODING BRIDGEWIRE SYSTEMS. A SWITCH OF THIS TYPE, COUPLED WITH THE NEW "BATCH PRODUCED" SLAPPER DETONATORS WILL LOWER THE COST OF THESE HIGH ENERGY INITIATION SYSTEMS TO THE

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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POINT WHERE THEY ARE COMPETITIVE WITH SQUIB DESIGNS. THE INHERENT SAFETY IN THESE SYSTEMS WILL PERMIT THEIR USE IN LOW-COST S&A DEVICES. QUANTIC INDUSTRIES HAS DEVELOPED SUCH A SWITCH, WHICH CAN REPLACE THE SPARK-GAP TUBES IN EBW SYSTEMS. INITIAL EFFORTS INDICATE THAT REFINEMENTS TO THE DESIGN SHOULD PRODUCE A SWITCH THAT CAN ACHIEVE BETTER THAN 0.1 MICROSECOND SIMULTANEITY WITH A LESS THAN 0.4 MICROSECOND TOTAL FIRING DELAY. QUANTIC PROPOSES A DESIGN AND TEST PROGRAM TO DETERMINE: 1) THE SIMULTANEITY OF ONE OR MORE SWITCHES; 2) THE DELAY TO FIRE; 3) THE RELIABILITY OF THE SWITCH; AND 4) THE DESIGN OF AN IMPROVED FIRING UNIT. THIS WILL BE ACCOMPLISHED BY PRODUCING CIRCUIT PROTOTYPES, PERFORMING TESTS AND RELIABILITY CALCULATIONS, AND INVESTIGATING ALTERNATE PACKAGING CONCEPTS AND TRANSISTOR DESIGNS. AN IMPROVED FIRING UNIT PROTOTYPE DESIGN WILL BE BREADBOARDED.

QUANTUM DESIGN, INC.
11404 SORRENTO VALLEY ROAD, SUITE 114
SAN DIEGO, CA 92121
DR. RONALD E. SAGER

NAVY \$ 72,887

TITLE:
AN IMPROVED OPTICALLY PUMPED MAGNETIC DETECTOR FOR LOCATING
DEEPLY BURIED FERROUS ORDNANCE
TOPIC: 73 OFFICE: NSSC

OPTICALLY PUMPED MAGNETIC DETECTORS ARE CURRENTLY USED IN MILITARY APPLICATIONS TO DETECT BURIED ORDNANCE AND UNDERWATER MINES, BUT EXISTING INSTRUMENTS HAVE LIMITED SENSITIVITY. DR WILLIAM HAPPER HAS SUGGESTED THAT OPTICALLY PUMPED SENSORS CAN BE DRAMATICALLY IMPROVED AND MIGHT ULTIMATELY PROVIDE A SENSITIVITY COMPARABLE TO THAT OF SUPERCONDUCTING GRADIOMETERS. IN THIS PROPOSAL WE OUTLINE PRELIMINARY EXPERIMENTS WHICH SHOULD DEMONSTRATE THE FEASIBILITY OF CONSTRUCTING A FREE PRECESSION, OPTICALLY PUMPED MAGNETIC DETECTOR SUCH AS HAPPER DESCRIBES. PHASE I WILL ADDRESS THE CRITICAL PROBLEMS OF ABSORPTION CELL WALL COATINGS, THE DEPHASING OF THE COHERENT LARMOR PRECESSION, AND THE DETECTION OF THE LARMOR FREQUENCY IN A FREE PRECESSION SYSTEM. THE FINAL PART OF PHASE I WILL BRIEFLY EXAMINE THE ENGINEERING PROBLEMS OF PRODUCING A HIGH INTENSITY OPTICAL PUMPING BEAM, A COMMON-SOURCE DETECTING BEAM, AND THE ELECTRONIC SIGNAL PROCESSING SYSTEM. THE FINAL REPORT WILL COMBINE THESE DATA INTO A PRELIMINARY CONCEPTUAL DESIGN FOR A PROTOTYPE

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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INSTRUMENT.

RASOR ASSOCIATES, INC. 253 HUMBOLDT CT. SUNNYVALE, CA 94086 NED S. RASOR TITLE: NOVEL HIGH-CURRENT CIRCUIT BREAKER AND CURRENT LIMITER FOR NAVAL SHIPBOARD ELECTRONIC POWER (RAP-088) TOPIC: 51	NAVY	\$ 49,257
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OFFICE: NSSC

AN EMISSION-CONTROLLED DEVICE FOR LIMITING AND TERMINATING CURRENT IN UTILITY POWER LINE TRANSMISSION AND DISTRIBUTION NETWORKS HAS BEEN DEVELOPED AND DEMONSTRATED EXPERIMENTALLY BY RASOR ASSOCIATES THROUGH FUNDING BY THE ELECTRIC POWER RESEARCH INSTITUTE. BECAUSE OF ITS AUTOMATIC INSTANTANEOUS RESPONSE TO LIMIT CURRENT SURGES AND OVERLOADS, AND BECAUSE OF IT MAKES POSSIBLE THE USE OF SIMPLE MECHANICAL SWITCHES FOR INTERRUPTING THE MOST SEVERE FAULTS IN HIGH CURRENT SYSTEMS, THIS DEVICE MAY SUBSTANTIALLY IMPROVE THE EFFECTIVENESS AND SURVIVABILITY OF SHIPBOARD ELECTRIC POWER SYSTEMS. THE OBJECTIVES OF THE PROPOSED PHASE I WORK ARE TO DETERMINE THE TECHNICAL AND ECONOMIC FEASIBILITY OF THE EMISSION FAULT CURRENT LIMITER (EFCL) IN THIS APPLICATION BY DESIGNING AND COST-ANALYZING A REFERENCE EFCL FOR AUGMENTING OR REPLACING EXISTING CIRCUIT BREAKERS IN SHIPBOARD ELECTRIC POWER SYSTEMS; TO DESIGN A PRE-PROTOTYPE EFCL BASED ON THE SHIPBOARD REQUIREMENTS FOR TESTING IN PHASE II; AND TO PREPARE A COMPREHENSIVE PROGRAM PLAN FOR PHASE II LEADING TO TESTING OF A PRODUCTION MODEL IN PHASE III.

REGENCY SYSTEMS, INC. 1610 INTERSTATE DRIVE, P.O. BOX 3578 CHAMPAIGN, IL 61821 ROGER H. TAYLOR TITLE: HUMAN ENGINEERING AND TRAINING; CLASSIFICATION/ANALYSIS SYSTEM FOR EARLY AIRCREW TRAINING TOPIC: 2a	AF	\$ 34,692
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OFFICE: AFHRL/XR

AIRCREW AND PILOT TRAINING IN THE PAST HAS BEEN LIMITED TO A COMBINATION OF THEORY AND ON-THE-JOB TRAINING. AIRCRAFT SIMULATORS ARE NOW USED BUT ARE EXCEEDINGLY EXPENSIVE TO PURCHASE AND TO OPERATE. PRE-SIMULATOR TRAINING CAN BE PRESENTED USING HIGH RESOLUTION, TOUCH SEN-

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>SITIVE MICROCOMPUTERS THAT ARE HIGHLY INTERACTIVE AND EASILY PROGRAMMED. REGENCY SYSTEMS HAS DEVELOPED THIS TYPE OF MICROCOMPUTER AND IS USED IN THE AIRLINE INDUSTRY. REGENCY SYSTEMS PROPOSES TO PRESENT TRAINING EXERCISES ON THE R2 THAT WILL CLASSIFY AND ANALYZE INDIVIDUALS AS TO THEIR ABILITIES AND MAKE RECOMMENDATIONS FOR FURTHER TRAINING PROCEDURES FOR EACH INDIVIDUAL.</p>		

REN CORPORATION 5900 S. US 177 ROUTE 4, BOX 90A1 STILLWATER, OK 74074 BRENT COPPOCK TITLE: AUTOMATED AMMUNITION LOADING OF COMBAT VEHICLE TOPIC: 5d OFFICE: HEL	ARMY	\$ 49,173
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THE APPLICATION OF LOAD-SENSING HYDRAULICS IN AN AUTOMATED SYSTEM DESIGNED AS A TANK AMMUNITION HANDLER IS PROPOSED. THESE STATE-OF-THE-ART COMPONENTS LEND THEMSELVES TO EFFICIENT MATERIAL HANDLING APPLICATIONS AND HAVE BEEN PROVEN IN DESIGNS USING A MICROPROCESSOR CONTROL. A COMPUTER SIMULATION OF A LOAD-SENSING HYDRAULIC CIRCUIT WILL PERMIT TAILORING OF THE COMPONENTS BEFORE A HARDWARE COMMITMENT IS MADE. A ROBOTIC DESIGN USING LOAD-SENSING ACTUATORS PROMISES AN EFFICIENT, RELIABLE APPROACH.

SCANDURA TRAINING SYSTEMS, INC. 1249 GREENTREE LANE NARBERTH, PA 19072 DR. A. B. SCANDURA TITLE: A PROCEDURE FOR GENERATING COMPUTERIZED PERFORMANCE AIDS/TRAINING SYSTEMS FOR PROCEDURAL COGNITIVE TASKS TOPIC: 2 OFFICE: AFHRL/TSM	AF	\$ 57,119
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RECENT ADVANCES IN THE COGNITIVE, INSTRUCTIONAL AND COMPUTER SCIENCES PROVIDE AN OPPORTUNITY FOR THE DEVELOPMENT OF A NEW GENERATION OF TRAINING SYSTEMS AT LOWER COST AND GREATER EFFECTIVENESS THAN PREVIOUSLY POSSIBLE. SPECIFICALLY, THE PROPOSED EFFORT BUILDS ON TWO UNIQUE

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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OPPORTUNITIES: (A) OUR GENERAL PURPOSE RULETUTOR, THE CONTENT-INDEPENDENT SOFTWARE NECESSARY FOR CONSTRUCTING ANY PROCEDURAL COGNITIVE PERFORMANCE ID/TRAINING SYSTEM AND (B) SPECIFICATIONS FOR A GENERAL METHOD OF COGNITIVE TASK ANALYSIS, CALLED STRUCTURAL ANALYSIS (SA). SA TAKES AS INPUT SPECIFIC TASK SOLUTIONS GENERATED BY EXPERTS AND GENERATES PSYCHOLOGICALLY RELEVANT PROCEDURAL SPECIFICATIONS (FOR GIVEN CLASSES OF TASKS). THE PROPOSED RESEARCH IS DESIGNED TO FULLY AUTOMATE SA AND TO INTERGRATE IT WITH THE GENERAL PURPOSE RULETUTOR. MORE SPECIFICALLY, WE PROPOSE TO USE THE RULETUTOR AS A BASIS FOR AN ENTIRE CLASS OF PERFORMANCE AIDS AND INDIVIDUALIZED TRAINING SYSTEMS. MAJOR EFFORT WILL GO INTO AUTOMATING THE PROCESS OF SA AND DEVELOPING A VERY HIGH LEVEL RULE-ORIENTED LANGUAGE WHICH WILL TAKE THE RESULTS OF SA (I.E., PSYCHOLOGICALLY RELEVANT RULES AND RULE COMPONENTS) AND AUTOMATICALLY GENERATE (LOWER-LEVEL LANGUAGE) SOFTWARE CODE (E.G., PASCAL OR EVEN BASIC) AND INTEGRATE IT INTO THE GENERAL PURPOSE RULETUTOR.

SCIENCE AND TECHNOLOGY CORP.(STC)
17 RESEARCH DRIVE
HAMPTON, VA 23666
GEOFFERY S. KENT

NAVY \$ 21,904

TITLE:

THE DESIGN OF A MULTIBEAM LIDAR SYSTEM FOR THE STUDY OF FORMATION, DISPERSION, AND THREE-DIMENSIONAL STRUCTURE OF FOG, SMOKE
TOPIC: 118 OFFICE: ONR

THIS PROPOSAL IS BEING SUBMITTED FOR THE DESIGN OF A NEW TYPE OF LIDAR SYSTEM FOR THE DETERMINATION OF THE THREE-DIMENSIONAL STRUCTURE OF THE TROPOSPHERE AND ITS CONSTITUENTS. THE MULTIBEAM LIDAR SYSTEM IS BASED ON A NEW PRINCIPAL, NOT PREVIOUSLY USED, WHICH OFFERS SEVERAL ADVANTAGES OVER A SCANNING LIDAR WITH WHICH IT MAY BE COMPARED. THESE ADVANTAGES ARE DESCRIBED IN DETAIL IN THE PROPOSAL. THE EMPHASIS IN THIS PROPOSAL IS ON APPLICATION OF THE SYSTEM TO THE STUDY OF FOG AND CLOUD, BUT THE TECHNIQUE COULD BE ADOPTED FOR OTHER APPLICATIONS (E.G. TO THE STUDY OF THE DISPERSION OF SMOKE AND CONTAMINANT GASES). THE TOTAL STUDY IS DIVIDED INTO THREE PHASES--SYSTEM DESIGN, CONSTRUCTION AND APPLICATION. PHASE I-SYSTEM DESIGN-FORMS THE SUBJECT OF THE CURRENT PROPOSAL. THERE ARE SEVERAL APPLICATIONS OF THIS NEW TECHNIQUE

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
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WHICH ARE POTENTIALLY USEFUL TO THE THREE BRANCHES OF THE DEPARTMENT OF DEFENSE.

SCIENTIFIC MEASUREMENT SYSTEM, INC 2808 LONGHORN BOULEVARD, SUITE 303 AUSTIN, TX 78759 S.R. GAUTAM, PH.D. TITLE: APPLICATION OF COMPTON INTERACTION TOMOGRAPHY FOR NON- DESTRUCTIVE INSPECTION OF LAMINATED COMPOSITE STRUCTURES TOPIC: 99 OFFICE: NASC	NAVY	\$ 49,768
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AN INNOVATIVE APPROACH TO NONDESTRUCTIVE INSPECTION OF LAMINATED COMPOSITE STRUCTURES, BASED ON THE COMPTON INTERACTION TOMOGRAPHIC PROCESSES IS PROPOSED. ACTUAL AS WELL AS SPECIALLY FABRICATED COMPOSITE OBJECTS WILL BE EXPERIMENTALLY TESTED ON A LABORATORY TOMOGRAPHIC SYSTEM. EMPIRICAL DATA BASE OBTAINED, IN CONJUNCTION WITH COMPUTER SIMULATION STUDIES, WILL BE EXTENSIVELY ANALYZED TO DETERMINE PARAMETRIC REQUIREMENTS OF A PROTOTYPE OPTIMAL PERFORMANCE FIELD SCANNER.

SCIENTIFIC RESEARCH ASSOCIATES POST OFFICE BOX 498 GLASTONBURY, CT 06033 DR. STEPHEN J. SHAMROTH TITLE: PROPOSAL TO DEVELOP A SHIP PROPELLER TIP VORTEX ANALYSIS TOPIC: 123 OFFICE: NR	NAVY	\$ 61,322
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A PROPOSAL IS PRESENTED HEREIN TO DEVELOP A NUMERICAL PROCEDURE FOR ANALYZING THE SHIP PROPELLER TIP VORTEX PROBLEM. THE FLOW IN THIS REGION IS VERY COMPLEX AS IT CONTAINS THREE-DIMENSIONAL, VISCOUS AND CENTRIFUGAL EFFECTS. THE LONG TERM GOAL OF THE PROPOSED EFFORT WOULD DEVELOP A COMPREHENSIVE PREDICTIVE PROCEDURE FOR THE SHIP PROPELLER TIP REGION WITH PARTICULAR EMPHASIS ON THE TIP VORTEX CAVITATION PROBLEM. ALTHOUGH THIS LONG TERM GOAL WOULD REQUIRE A VARIETY OF EFFORTS FOCUSED UPON TURBULENCE MODELING, BLADE GEOMETRY, ROTATIONAL EFFECTS,

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
ETC., THE FIRST PHASE AS HEREIN PROPOSED WOULD FOCUS UPON REVISING AN EXISTING CODE TO INCLUDE ROTATIONAL EFFECTS, DEVELOPING A GEOMETRIC TWIST CAPABILITY AND PERFORMING A DEMONSTRATION CALCULATION.		

SCIENTIFIC RESEARCH ASSOCIATES, INC. P.O. BOX 498 GLASTONBURY, CT 06033 HAROLD L. GRUBIN TITLE: THREE DIMENSIONAL TRANSIENT SIMULATIONS OF THE RESPONSE OF SILICON DEVICES TO ALPHA PARTICLE RADIATION TOPIC: 2	DNA	\$ 97,440
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SOFT ERRORS INDUCED BY IONIZING PARTICLES CONSTITUTE ONE OF THE MOST PRESSING PROBLEMS OF PRESENT SEMICONDUCTOR TECHNOLOGY. HARDENING MEASURES HAVE BEEN ATTEMPTED EMPIRICALLY AND THROUGH CIRCUIT SIMULATION, DESIGN MODIFICATION, AND DEVICE SIMULATION. A NECESSARY COMPONENT TO THESE STUDIES IS AN ACCURATE REPRESENTATION OF CIRCUIT RESPONSE, CHARGE COLLECTED, AND IN SOME CASES THE FUNNEL LENGTH. INsofar AS SIGNIFICANT TIME TRANSIENTS FOLLOWING AN ALPHA STRIKE OCCUR USUALLY WITHIN THE FIRST TWO NANoseconds, PREDICTABLE CAPABILITY FOR DIFFERENT DEVICE STRUCTURES WITHIN THIS TIME FRAME IS NEEDED. THIS CAN ONLY OBTAINED THROUGH NUMERICAL SIMULATION. NUMERICAL SIMULATION OF THE TRANSIENT RESPONSE HAS TENDED TO RELY HEAVILY ON TWO DIMENSIONAL ALGORITHMS. THESE TWO DIMENSIONAL ALGORITHMS, WHILE EXTREMELY VALUABLE FOR ASCERTAINING IMPORTANT PHENOMENOLOGY, WILL NOT ACCURATELY REPRESENT THE THREE DIMENSIONAL NATURE OF THE PROBLEM PARTICULARLY WHEN DEVICE GEOMETRIES ARE REDUCED IN SIZE. THE PRESENT PROPOSAL DEALS WITH EXTENDING RESEARCH ASSOCIATES' CAPABILITY FOR TREATING THREE DIMENSIONAL SEMICONDUCTOR TRANSPORT PROBLEMS TO THE IMPORTANT AREA OF THREE DIMENSIONAL TRANSIENTS ASSOCIATED WITH INCIDENT RADIATION EFFECTS. THE PROBLEM TO BE STUDIED IS THAT OF A NP JUNCTION DEVICE WITH EDGES NOT GREATER THAN FIVE MICRONS, AND ITS TRANSIENT RESPONSE TO AN ALPHA PARTICLE INCIDENT THROUGH THE N WELL.

SCIENTIFIC RESEARCH ASSOCIATES, INC. PO BOX 498 GLASTONBURY, CT 06033 HAROLD L. GRUBIN TITLE: TWO-DIMENSIONAL NUMERICAL SIMULATION OF THE GALLIUM ARSENIDE PERMEABLE BASE TRANSITOR USING MOVEMENTS OF BOLTZMAN EQUATION TOPIC: 1	AF	\$ 49,989
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THERE HAS BEEN IN THE PAST, AND WILL CONTINUE TO BE IN THE FUTURE, APPLICATIONS FOR HIGH FREQUENCY THREE-TERMINAL DEVICES. THE REQUIREMENTS FOR HIGH FREQUENCY DEVICES HAS LED TO THE DEVELOPMENT OVER THE PAST FEW YEARS OF A NUMBER OF NEW DEVICE CONFIGURATIONS.

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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THESE INCLUDE THE PERMEABLE BASE TRANSISTOR, THE PLANER DOPED BARRIER TRANSISTOR, THE HIGH ELECTRON MOBILITY TRANSISTOR, THE SUB-MICRON GATE GALLIUM ARSENIDE FIELD EFFECT TRANSISTOR, AND MANY OTHERS. TO ACHIEVE THESE HIGH FREQUENCIES REQUIRES NEAR AND SUB-MICRON DIMENSIONED GEOMETRIES, AND THE DESIGNS NEEDED FOR DEVICE FABRICATION RESTS HEAVILY ON AN UNDERSTANDING OF THE DEVICE OPERATIONAL PHYSICS. FOR SUBMICRON DEVICES THIS OPERATIONAL PHYSICS IS OBTAINED ONLY FROM SOLUTIONS TO THE BOLTZMANN TRANSPORT EQUATION AND INCLUDES SUCH PHENOMENA AS VELOCITY OVERSHOOT. THE PURPOSE OF THE PROPOSED PLAN IS TO DESCRIBE THE USE OF AN EXISTING TWO-DIMENSIONAL ALGORITHM FOR SOLVING THE FIRST THREE MOMENTS OF THE BOLTZMANN TRANSPORT EQUATION TO STUDY THE ELECTRICAL CHARACTERISTICS OF A DEVICE OF CONSIDERABLE IMPORTANCE TO THE DEPARTMENT OF DEFENSE'S HIGH FREQUENCY GOALS: THE GALLIUM ARSENIDE PERMEABLE BASE TRANSISTOR.

SCIENTIFIC RESEARCH ASSOCIATES, INC.	AF	\$ 70,000
P.O. BOX 498		
GLASTONBURY, CT 06033		
STEPHEN J. SHAMROTH		
TITLE:		
DEVELOPMENT OF A DESIGN-ORIENTED NAVIER-STOKES CASCADE ANALYSIS		
TOPIC: 13	OFFICE: AFWAL/XPR-PO	

A PROPOSAL IS PRESENTED TO DEVELOP A DESIGN-ORIENTED NAVIER-STOKES CASCADE COMPUTER CODE. DEVELOPMENT OF SUCH A CODE WHICH COULD BE RAN SUCCESSFULLY BY A NEW CODE USER, WOULD BE A MAJOR BENEFIT IN THE COMPRESSOR OR TURBINE DESIGN PROCESS. UNDER THE PROPOSED EFFORT, BOTH A COORDINATE GENERATION CODE AND A NAVIER-STOKES SOLVER WOULD BE REVISED TO ALLOW STRAIGHT-FORWARD IMPLEMENTATION. IN ADDITION, THE CODE WOULD BE MODIFIED TO DECREASE RUN TIME, WITH A GOAL OF UNDER FIVE MINUTES OF CDC 7600 CPU TIME FOR A CONVERGED CASCADE CALCULATION.

SCIENTIFIC SYSTEMS, INC.	AF	\$ 59,000
54 RINDGE AVENUE EXTENSION		
CAMBRIDGE, MA 02140		
DR. JOHN BAILLIEUL		
TITLE:		
KINEMATICALLY REDUNDANT ROBOT MANIPULATORS		
TOPIC: 11i	OFFICE: AFWAL/XRPM	

BECAUSE NONMINIMALLY ARTICULATED (OR KINEMATICALLY REDUNDANT) ROBOT MANIPULATORS HAVE EXTRA DEGREES OF FREEDOM WITH WHICH TO MOVE AND ORIENT END EFFECTORS IN THE WORKSPACE, THEY OFFER A NUMBER OF ADVANTAGES OVER CURRENTLY AVAILABLE DESIGNS. FROM THE VIEWPOINT OF PROGRAM-

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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MING AND CONTROL, HOWEVER, THERE ARE POTENTIAL PROBLEMS DUE TO THE INCREASED COMPLEXITY OF THE KINEMATICS AND DYNAMICS. A SIX MONTH RESEARCH EFFORT IS PROPOSED TO COMPARE THE ADVANTAGES AND LIABILITIES OF NONMINIMALLY ARTICULATED MANIPULATORS, AND TO LAY THE GROUNDWORK FOR FUTURE DEVELOPMENT OF DESIGN TOOLS AND CONTROL SOFTWARE FOR THESE DEVICES.

SCIENTIFIC SYSTEMS, INC. 54 RINDGE AVENUE EXT. CAMBRIDGE, MA 02140 CLARK M. NEILY, JR. TITLE: INVESTIGATION OF AIR-TO-SPACE INTERCEPT GUIDANCE LAWS TOPIC: 17c	AF	\$ 51,464
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THIS INVESTIGATION WILL DEVISE GUIDANCE LAWS FOR THE INTERCEPTION AND RENDEZ-VOUS OF SPACE VEHICLES. SUITABLE REGIMES FOR BOTH HIGH AND LOW ENERGY INTERCEPTS WILL BE DISCUSSED. THESE TECHNIQUES WILL BE APPLICABLE TO BOTH MANNED AND UNMANNED VEHICLES. EXPLICIT ACCOUNT WILL BE TAKEN OF THE CONSTRAINTS AND REQUIREMENTS IMPLIED BY VARYING LEVELS OF TARGET TRACKING SENSOR PERFORMANCE, ENGAGEMENT SCENARIOS, REASONABLE PROPELLANT LIMITATIONS, AND TIME CONSTRAINTS.

SCIENTIFIC SYSTEMS, INC. 54 RINDGE AVENUE EXTENSION CAMBRIDGE, MA 02140 DONALD E. GUSTAFSON TITLE: AUTONOMOUS TARGET ACQUISITION ALGORITHMS AND PROCESSOR DEVELOPMENT FOR SELF CONTAINED MUNITIONS TOPIC: 3b	ARMY	\$ 50,000
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THE TECHNICAL OBJECTIVE OF PHASE I IS TO DEMONSTRATE THE FEASIBILITY OF USING INNOVATIVE STATISTICAL PATTERN RECOGNITION ALGORITHMS TO PERFORM THE TARGET IDENTIFICATION FUNCTION APPLICABLE TO AUTOMATIC TARGET CUEING FOR FIBER OPTIC GUIDED MUNITIONS AND AUTONOMOUS TARGET

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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ACQUISITION FOR SELF-CONTAINED GUIDED MUNITIONS THAT USE A LOAL MODE OF OPERATION. THE SPECIFIC OBJECTIVE IS TO DEMONSTRATE A PROBABILITY OF SUCCESSFUL TARGET RECOGNITION GREAT ENOUGH TO WARRANT THE USE OF THE ALGORITHM WITH THE FOGM TARGET ACQUISITION DEVICE AS A MEANS OF REDUCING THE OPERATIONAL TIME LINE. THE TECHNICAL GOAL IS TO DEMONSTRATE A FALSE ALARM RATE AND A MISS RATE LOW ENOUGH TO JUSTIFY THE ALGORITHM'S USE IN AN AUTONOMOUS LOAL TERMINAL GUIDANCE SYSTEM.

SCIENTIFIC SYSTEMS, INC. 54 RINGE AVENUE EXTENSION CAMBRIDGE, MA 02140 ALEX L. KOSMALA TITLE: DISTRIBUTED PROCESSOR COMPILER DEVELOPMENT TOPIC: 8c	ARMY	\$ 48,033
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OFFICE: BMDSC-CPP

THIS RESEARCH IS AIMED AT IMPROVING TECHNIQUES EMPLOYED TO DATE FOR DEVELOPING APPLICATION SOFTWARE FOR DISTRIBUTED PROCESSING CONFIGURATIONS. THE BASIC CONCEPT IS TO DERIVE A COMPUTATIONAL DATA FLOW GRAPH FROM THE INITIAL PROCEDURAL CODE PRODUCED BY THE PROGRAMMER. THE DATA FLOW GRAPH IS THEN ANALYZED FOR INHERENT PARALLELISM AND POTENTIAL PIPELINING AND MAPPED INTO THE SPECIFIED CONFIGURATION OF DISTRIBUTED PROCESSORS. THE TECHNICAL APPROACH OFFERED HERE IS TO PERFORM THE TRANSLATION AND MAPPING OF THE PROCEDURAL FORM AUTOMATICALLY THROUGH EXTENSION AND MODIFICATION OF EXISTING COMPILER TECHNOLOGY. THE PHASE I EFFORT PROPOSED HERE WILL DEMONSTRATE THE FEASIBILITY OF THIS CONCEPT, FOR A PLANNED PHASE II DEVELOPMENT OF A PROTOTYPE COMPILER. SPECIFIC TASKS INVOLVE SELECTING A LANGUAGE SET, DEFINING A CANDIDATE PROCESSING ARCHITECTURE, DEVELOPMENT OF AN ALGORITHM FOR DERIVING FLOW GRAPHS, SYNTHESIS OF A REALTIME FORM, AND ,FINALLY, A FEASIBILITY DEMONSTRATION OF THE CONCEPT.

SESCO, INC. 1235 S. JEFFERSON DAVIS HIGHWAY ARLINGTON, VA 22202 MARSH E WRIGHT TITLE: REDUCTION OF MANNING IN USN SHIPBOARD COMBAT SYSTEM OPERATION TOPIC: 44	NAVY	\$ 49,997
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OFFICE: NSSC

MANPOWER COSTS ARE A MAJOR FACTOR IN DETERMINING LIFE CYCLE COST OF A SHIP SYSTEM. IN THE CASE OF A COMPLEX SHIPBOARD SYSTEM, SUCH AS THE AEGIS COMBAT SYSTEM, THE IMPACT OF OPERATIONAL MANPOWER ON TOTAL SYSTEM COST IS PARTICULARLY ACUTE. THE REDUCTION OF HIGH QUALITY,

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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HIGHLY TRAINED COMPLEX COMBAT SYSTEM PERSONNEL IS A HIGH PAYOFF PROGRAM OBJECTIVE. AS THE AEGIS CRUISER CLASS MOVES INTO THE FLEET AND THE DDG-51 CLASS DESTROYER ENTERS THE ACQUISITION PHASE, WINDOW OF OPPORTUNITY EXISTS TO CONDUCT A RIGOROUS, OBJECTIVE SYSTEM ANALYSIS OF THE MAN-MACHINE/MAN-COMPUTER INTERFACE IN AN OPERATIONAL ENVIRONMENT USING DESIGN WORK STUDY TECHNIQUES. THIS PROPOSED EFFORT WILL INVOLVE ANALYZING THE CURRENT CG 47 AEGIS COMBAT SYSTEM COMBAT INFORMATION CENTER IN SCENARIOS DEVELOPED TO EXERCISE THE AAW, ASW, C3 AND ELW SYSTEMS. THE COMBAT SYSTEM WILL BE ANALYZED TO DEVELOP ALTERNATIVES TO THE STRUCTURE OF OPERATOR ROLES AND THE BALANCE BETWEEN MAN-MACHINE/MAN-COMPUTER INTERFACES AND THE METHODOLOGY USED WILL BE EVALUATED AND USED AS A BASELINE TO DEVELOP A STANDARD OPERATING PROCEDURE FOR COMBAT SYSTEM OPERATIONAL ANALYSIS FOR REDUCTION OF OPERATIONAL MANNING.

SESCO, INC.
1235 S. JEFFERSON DAVIS HIGHWAY
ARLINGTON, VA 22202
MARSH E WRIGHT

NAVY \$ 49,987

TITLE:

SHIP SYSTEMS INITIATIVES, JUSTIFICATION AND PRIORITIZATION

TOPIC: 29 OFFICE: NSSC

A PRIMARY OBJECTIVE OF THE SHIPS SYSTEM INITIATIVE DEVELOPMENT (SID) PROGRAM IS TO IDENTIFY SHORTFALLS OR INEFFICIENCIES IN CURRENT OR PROJECTED SHIP SYSTEMS BASED ON A RIGOROUS, DISCIPLINED CAPABILITY ASSESSMENT OF US FORCES VERSUS ENEMY FORCES IN FUTURE (YEAR 2000) BATTLE GROUP ENVIRONMENTS. THESE SHORTFALLS CAN BE ELIMINATED BY DEVELOPING NEW TECHNOLOGIES AND SYSTEMS TO MEET THE REQUIREMENTS IDENTIFIED IN THE SID PROCESS. POTENTIAL SOLUTIONS TO ELIMINATE THESE SHORTFALLS MUST BE IDENTIFIED, ANALYZED FOR POTENTIAL MILITARY WORTH AND APPLICABILITY, TESTED AND EVALUATED IN THE SID BATTLE GROUP ENVIRONMENTS AND PROPER JUSTIFICATION DOCUMENTATION, SUCH AS A JMSNS, PREPARED IN ACCORDANCE WITH DOD INSTRUCTIONS TO INITIATE THE NEW PROGRAM INTO THE R&D PROCESS. THE SID PROGRAM ALSO IDENTIFIES NEW SHIP CONCEPTS FOR ENTRY IN THE EXPLORATORY DESIGN PROCESS AND WILL INTEGRATE THESE NEW R&D SYSTEM INITIATIVES INTO ONGOING SHIP DESIGN AND ACQUISITION PROGRAMS. THE DATA BASE OF INFORMATION DEVELOPED IN THE SID PROCESS PROVIDES THE FOUNDATION FOR AN IN DEPTH ANALYSIS

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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OF EACH POTENTIAL SOLUTION TO DETERMINE: (1) EXPECTED PERFORMANCE CAPABILITIES TO MEET THE MILITARY REQUIREMENT, (2) TECHNICAL RISK, AND (3) SCHEDULE RISK. THE PRIMARY OBJECTIVE OF THIS PHASE I EFFORT WILL BE TO DEVELOP A METHOD TO CONDUCT THIS ANALYSIS FOR EACH POTENTIAL R&D INITIATIVES.

SHENANDOAH SYSTEMS COMPAY
800 FOLLIN LANE SUITE 230
VIENNA, VA 22180
RICHARD C ROBINSON

NAVY \$ 82,210

TITLE:

AUTOMATIC DATA PROCESSING FOR SIDE SCAN SONAR AND MAGNETOMETER
DATA

TOPIC: 74 OFFICE: NSSC

MINE HUNTING WITH SIDE SCAN SONARS AND MAGNETOMETERS IS PROVING TO BE A LOW COST MEANS OF LOCATING MINES AND MINE-LIKE OBJECTS ON THE OCEAN BOTTOM. IT IS ALSO THE MOST EFFECTIVE MEANS OF PRECISELY CHARTING NON-MINE BOTTOM OBJECTS (NOMBOS) THAT CONSTITUTE THE CLUTTER IN A CHANNEL OR SEA ROUTE THAT ARE FALSE TARGETS TO MINE HUNTER PLATFORMS. HOWEVER, CURRENT SIDE SCAN SONAR AND MAGNETOMETER SEARCH TECHNIQUES AND MANUAL AND SKILLED LABOR INTENSIVE. THE PROCESS ALSO INTRODUCES DELAYS AND PLOTTING ERRORS INTO THE PROCESS. THE PROGRAM PROPOSED HEREIN, WILL DEVELOP THE EQUIPMENT AND COMPUTER SOFTWARE TO HIGHLY AUTOMATE THE PROCESS THUS REDUCING SKILLED LABOR REQUIREMENTS. THE LEVEL OF AUTOMATION PROVIDED WILL SUPPORT REAL-TIME OPERATIONS ON SMALL CRAFT AND ELIMINATE THE POSTION LOCATION ERRORS INHERENT IN MANUAL CHARTING OF OBJECT POSITIONS. THE RESULT WILL BE AT LEAST AN ORDER OF MAGNITUDE INCREASE IN THE EFFICIENT USE OF THE SIDE SCAN SONAR AND MAGNETOMETER AS MINE HUNTING SENSORS.

SIGNATRON, INC.
12 HARTWELL AVENUE
LEXINGTON, MA 02173
JAMES M. KATES

ARMY \$ 57,000

TITLE:

ADAPTIVE CANCELLATION OF ENGINE NOISE

TOPIC: 29 OFFICE: DRSEL-CECOM

VOICE COMMUNICATIONS FOR COMMAND AND CONTROL CAN BE SEVERELY IMPAIRED BY THE PRESENCE OF BACKGROUND NOISE AT THE TALKER'S MICROPHONE. ONE OF THE MAJOR SOURCES OF BACKGROUND NOISE IS ENGINE OR TURBINE NOISE. SIGNATRON PROPOSES A NEW APPROACH FOR AN ADAPTIVE NOISE CANCELLATION

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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SYSTEM TO REDUCE THE EFFECTS OF SUCH INTERFERENCE. THE NEW SYSTEM WILL USE MULTIPLE SENSORS TO OBTAIN THE MOST ACCURATE NOISE REFERENCE FORMS POSSIBLE. THESE SIGNALS WILL BE PROCESSED BY AN ADAPTATION ALGORITHM THAT IS COMPUTATIONALLY EFFICIENT AND HAS A RAPID RATE OF CONVERGENCE IN ORDER TO COMPENSATE FOR SPEECH MICROPHONE DISPLACEMENTS.

SILICON DESIGNS 7417 92ND PLACE SE MERCER ISLAND, WA 98040 JOHN C COLE TITLE: DIGITAL SAFE AND ARM DEVICE FOR GUIDED MISSILE TOPIC: 95	NAVY	\$ 47,245
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MAJOR ADVANCES IN MICROELECTRONIC AND MICROMECHANICAL COMPONENTS IN RECENT YEARS HAVE MADE POSSIBLE NEW DESIGN APPROACHES FOR A SAFE AND ARM DEVICE. DEVELOPMENTS IN CUSTOM INTEGRATED CIRCUITS NOW ALLOW THE DESIGN OF A "SUBSYSTEM ON A CHIP". RECENT ADVANCES HAVE ALSO BEEN MADE IN MICROMECHANICAL DEVICES, INCLUDING THE DEVELOPMENT OF A SILICON ACCELEROMETER. THE OFFEROR PROPOSES TO INVESTIGATE THE FEASIBILITY OF AN ELECTRONIC G-SWITCH USING AN INTEGRATED SILICON SENSOR AND AMPLIFIER AND A CUSTOM INTEGRATED CIRCUIT. A DESIGN CONCEPT FOR THE INTEGRATED SENSOR IS PROPOSED WHICH MINIMIZES SENSITIVITIES TO MANUFACTURING TOLERANCES AND ENVIRONMENTAL CONDITIONS. THE OFFEROR PROPOSES TO INVESTIGATE THE FEASIBILITY OF AN ELECTRONIC SEQUENCER TO PERFORM PREARM MESSAGE VALIDATION, SEQUENCING, AND TIMING FUNCTIONS. A SEQUENCER DESIGN CONCEPT IS PROPOSED WHICH TAKES ADVANTAGE OF DEVELOPMENTS IN MICROCOMPUTERS AND CUSTOM INTEGRATED CIRCUITS.

SIMULA INC 2223 S. 48TH STREET TEMPE, AZ 85282 JAMES C WARRICK TITLE: DEVELOPMENT OF AN IMPROVED LOAD-ATTENUATING SEAT CUSHION TOPIC: 9B	ARMY	\$ 36,039
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LOAD-ATTENUATING SEAT CUSHIONS DESIGNED FOR CRASHWORTHY SEATING SYSTEMS MUST SERVE A DUAL PURPOSE. SUFFICIENT CUSHIONING MUST BE USED TO EVENLY DISTRIBUTE CONTRACT LOADS TO AVOID PRESSURE POINTS THAT CAN CAUSE DISCOMFORT, BUT THE DEMANDS OF CRASHWORTHINESS

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
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REQUIRE A CUSHION OF MINIMUM THICKNESS TO MINIMIZE DYNAMIC OVERSHOOT OCCURRING DURING CRASH LOADING. ALSO, THE RIGORS OF FIELD USE CAN SERIOUSLY DEGRADE MATERIALS COMMONLY IN USE. THEREFORE, THE DESIGN OF CRASHWORTHY CUSHIONS REQUIRES A COMPROMISE BETWEEN COMFORT, CRASHWORTHINESS, AND DURABILITY. THIS PHASE I SBIR PROPOSAL DESCRIBES A PROGRAM TO INVESTIGATE CONCEPTS FOR IMPROVED DESIGN OF LOAD-ATTENUATING CUSHIONS. A NUMBER OF CONCEPTS THOUGHT TO BE FEASIBLE AT THE PRESENT TIME ARE DISCUSSED. THE PROGRAM CALLS FOR A MERIT RANKING OF THE IDEAS AND PRODUCTION OF GENERIC PROTOTYPES FOR A LEAST THE TWO MOST PROMISING CONCEPTS. THE GOAL OF THE RESEARCH EFFORT IS TO DEVELOP A CUSHION THAT INCORPORATES SUPERIOR COMFORT WITH A REDUCTION IN DYNAMIC OVERSHOOT DURING CRASH LOADING.

SIPPICAN OCEAN SYSTEMS, INC. SEVEN BARNABAS ROAD MARION, MA 02738 RICHARD W LANCASTER TITLE: INVESTIGATION ON A FIBER OPTIC COMMUNICATIONS LINK FOR USE WITH AN EXPENDABLE TWO-WAY COMMUNICATION BUOY TOPIC: 76	NAVY	\$ 49,500
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OFFICE: NESC

A CONTINUING REQUIREMENT EXISTS FOR REAL-TIME COMMUNICATIONS BETWEEN A SUBMERGED ATTACK SUBMARINE AND BATTLE GROUP COMMANDER. NONE OF THE COMMUNICATIONS SYSTEMS PRESENTLY AVAILABLE SATISFY THE REQUIREMENT COMPLETELY FOR SECURE, REAL-TIME, TWO-WAY COMMUNICATIONS AT HIGH SPEEDS AND DEEP DEPTHS. THE EXISTING TWO-WAY EXPENDABLE COMMUNICATIONS BUOY IS BANDWIDTH AND ENDURANCE LIMITED BECAUSE OF THE WIRE LINK USED IN ITS CONSTRUCTION. THIS PROPOSAL WILL STUDY THE FEASIBILITY OF SUBSTITUTING AN UNCABLED OPTICAL FIBER LINK FOR A WIRE LINK IN AN EXPENDABLE BUOY. INCLUDED WILL BE AN EVALUATION OF MECHANICAL RISKS FOR 4,5, AND 6 INCH DIAMETER PAYLOADS, FIBER OPTIC SYSTEM COMPONENTS, OPERATIONAL PARAMETERS AND INTERFACE REQUIREMENTS.

SOLOSYSTEMS, INC. 482 OAKMEAD PARKWAY SUNNYVALE, CA 94086 DR WEI-HANG CHU TITLE: KNOWLEDGE BASED SOFTWARE DIAGNOSTIC SYSTEM TOPIC: 5k	ARMY	\$ 57,000
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OFFICE: ARI/PERI-PO

IN THE CURRENT TECHNOLOGICAL INFORMATION EXPLOSION, COMPUTERS ARE INCREASINGLY MORE AVAILABLE. AS MORE AND MORE TASKS ARE PERFORMED BY COMPUTERS, MOST INDUSTRIAL AND MILITARY ORGANIZATIONS THEREFORE FACE A PROLIFERATION OF COMPUTERS OF DIFFERENT COMPUTING POWER, MAKE, AND

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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MODEL. TO BE ABLE TO USE A COMPUTER SYSTEM EFFECTIVELY, A PROGRAMMER NEEDS TO BE FAMILIAR WITH THE SPECIFICS IN THE OPERATION OF THE COMPUTER. MUCH OF THE KNOWLEDGE ON A COMPUTER SYSTEM IS LEARNED THROUGH TRIAL AND ERROR, AND GOES WELL BEYOND WHAT IS DESCRIBED IN THE USERS DOCUMENTATIONS. AS ONE COMPUTER SYSTEM IS USUALLY SUFFICIENTLY DIFFERENT FROM ANOTHER, THE PROGRAMMER'S KNOWLEDGE AND EXPERIENCE OF ONE SYSTEM IS GENERALLY NOT APPLICABLE TO ANOTHER. THE CURRENT STATE OF THE ART IN ARTIFICIAL INTELLIGENCE ALLOWS THE SYSTEM SPECIFIC KNOWLEDGE OF A PROGRAMMER TO BE ENCODED INTO A KNOWLEDGE BASE. THE PROPOSAL ADDRESSES THE ENCODING OF THE DIAGNOSTIC KNOWLEDGE OF A PROGRAMMER. THE EXPERT SYSTEM PROPOSED WILL ACCEPT A SOFTWARE FAULT, FORMULATES A HYPOTHESIS AS TO THE CAUSE OF THE FAULT, THEN GENERATES A PLAN TO RESOLVE THE DIFFICULTY. IF A PLAN FAILS TO GENERATE AN ACCEPTABLE RESULT, A META-PLAN CONTROLS THE REVISION OF EITHER THE HYPOTHESIS, OF THE PLAN, OR BOTH.

SPARTA SYSTEMS, INC. 13293 S. POINTE LAGUNA HILLS, CA, CA 92653 DR PHILIP D. HENSHAW TITLE: OPTICAL DETECTION OF REENTRY VEHICLES IN SCENES WITH HIGH BACKGROUND CLUTTER TOPIC: 8c	ARMY	\$ 49,615
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OFFICE: BMDSC-CPP

BOTH SPACE-BASED AND ADVANCED CONUS-BASED BALLISTIC MISSILE DEFENSE SYSTEM CONCEPTS REQUIRE THAT ATTACKING REENTRY VEHICLES (RVs) BE DETECTED AND TRACKED AT LONG RANGES TO ENABLE THE DEFENSE TO PERFORM ITS MISSION. CURRENT CONCEPTS FEATURE PASSIVE INFRARED SCANNING OR STARING MOSAIC SENSORS SYSTEMS TO DETECT RVs FROM AIRBORNE PLATFORMS AND BALLISTIC MISSILE PLUMES FROM SATELLITES. WE PROPOSE TO EVALUATE THE PERFORMANCE OF A NEW POINT SOURCE DETECTION ALGORITHM, KNOWN AS PHASE-ONLY IMAGING, TO DETECT RVs AGAINST AN EARTH BACKGROUND FROM SPACE AND TO DETECT THEM THROUGH HIGH-ALTITUDE NUCLEAR REDOUT CLUTTER FROM AIRCRAFT. THESE SITUATIONS RESULT IN HIGH INFRARED BACKGROUND RADIATION LEVELS WITH SIGNIFICANT STRUCTURE WHICH OVERWHELM THE SMALL RV SIGNATURES. PHASE-ONLY IMAGING TECHNIQUES, WHICH POSSESS THE IMPORTANT PROPERTIES OF REDUNDANCY REMOVAL AND POINT SOURCE ENHANCEMENT, HOLD GREAT PROMISE FOR GREATLY REDUCING CLUTTER BACKGROUNDS INDEPENDENT OF THE CLUTTER STRUCTURE. WE PROPOSE TO EVALUATE PHASE-ONLY IMAGE TECHNIQUES FOR RV DETECTION AND TO DETERMINE THE SENSOR AND SIGNAL

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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PROCESSING CONCEPTUAL DESIGNS AND TECHNOLOGY LEVELS REQUIRED TO
IMPLEMENT THESE TECHNIQUES IN BMD SYSTEM CONSTRUCTS.

SPECIALTY MICROWAVE PRODUCTS 117 SILVER STREET DOVER, NH 03820 DR. K. SIVAPRASAD TITLE: SENSOR SYSTEM FOR PERFORMANCE STRESS IN PILOTS TOPIC: 10c	AF	\$ 49,390
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THE PRIMARY TECHNICAL OBJECTIVES IN PHASE I IS THE DEVELOPMENT
OF A COMPUTER MODEL TO PREDICT THE PRESSURE OF THE BLOOD
AT PRINCIPAL JUNCTIONS SUCH AS THE EYE AND THE BRAIN UNDER GRAVITY AND
AND OTHER EFFECTS. A "TRANSMISSION LINE" APPROACH WILL BE USED IN THE
CREATION OF THE MODEL. FROM A KNOWLEDGE OF THE PRESSURE, THE DEGREE
STRESS A PILOT IS SUBJECT TO CAN BE PREDICTED AND USED AS THE BASIS
FOR A SOPHISTICATED SENSOR/CONTROL MECHANISM TO BE DEVELOPED IN PHASE
II.

SPECTRA RESEARCH SYSTEMS 555 SPARKMAN DRIVE, SUITE 1406 HUNTSVILLE, AL 35805 JOE L. THURMAN TITLE: RESEARCH ON LONG LIFE SPACECRAFT THERMAL CONTROL COATINGS IMPROVEMENT, MAINTENANCE AND REFURBISHMENT TOPIC: 10b	AF	\$ 49,041
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THIS RESEARCH ADDRESSES TECHNIQUES AND MATERIALS FOR ON-ORBIT MAIN-
TENANCE AND REFURBISHMENT OF THERMAL CONTROL SURFACE COATINGS USED ON
LONG-LIFE SPACECRAFT. IN MANY CASES, CONSERVATIVE ASSUMPTIONS ON THE
EFFECTS OF LONG-TERM DEGRADATION HAVE DRIVEN THE DESIGN OF SPACECRAFT
THERMAL SYSTEMS TOWARD OVER CAPACITY WHICH RESULTS IN WEIGHT, SIZE,
COMPLEXITY, AND COST PENALTIES. IF CRITICAL SURFACES COULD BE MAIN-
TAINED AND PERIODICALLY RENEWED EFFECTIVELY ON-ORBIT, SIGNIFICANT BEN-
FIT OBTAINED. THE PERFORMANCE OF COATINGS ON SPACECRAFT PREVIOUSLY

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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FLOWN AND THEIR DEGRADATION MECHANISMS WILL BE ANALYZED AND THERMAL CONTROL SYSTEM TRADE STUDIES CONDUCTED TO DETERMINE REFURBISHMENT REQUIREMENTS. THESE WILL BE THE BASIS FOR EVALUATING THE FEASIBILITY OF REFURBISHMENT TECHNIQUES SUCH AS ON-ORBIT PAINT SPRAYING, ABRASIVE CLEANING, CHEMICALLY REACTIVE COATINGS, NEW SURFACE ADHESIVE BONDING, POLISHING, ELECTROSTATIC APPLICATION, SELF CLEANING COATING, AND SOLVENT WIPING.

SPECTRA RESEARCH SYSTEMS 555 SPARKMAN DRIVE, SUITE 1406 HUNTSVILLE, AL 35805 RODNEY BRADFORD TITLE: RESEARCH ON LARGE, HIGHLY ACCURATE INFLATABLE REFLECTORS TOPIC: 3	AF	\$ 63,540
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VERY LARGE AND ACCURATE RELECTIVE SURFACES WILL BE REQUIRED FOR FUTURE APPLICATIONS SUCH AS LASER POWER TRANSMISSION, LASER PROPULSION, SOLAR ENERGY COLLECTION, ANTENNAS AND TELESCOPES. PRESENT TECHNIQUES USED TO CONSTRUCT HIGHLY ACCURATE RELECTORS ARE LIMITED IN APPLICATION TO DIAMETERS OF A FEW METERS (LESS THAN 5). METALLIZED THIN-FILM MEMBRANES HAVE THE POTENTIAL TO SATISFY THE REQUIREMENTS OF MOST FUTURE APPLICATIONS WITH MINIMUM WEIGHT SYSTEMS. THIS EFFORT PROPOSES TO IDENTIFY MATERIALS AND CONSTRUCTION TECHNIQUES TO IMPROVE THE ACCURACY OF INFLATABLE REFLECTORS OVER THAT ACHIEVED BY PREVIOUS EFFORTS. A NEW AND NOVEL APPROACH TO ACTIVE CONTROL WILL BE COMPARED TO BEST EFFORTS ATTAINED BY CONVENTIONAL PRESSURE SHAPING OF HOMOGENEOUS AND GORED THIN-FILM REFLECTORS.

SPECTRA RESEARCH SYSTEMS 555 SPARKMAN DRIVE, SUITE 1406 HUNTSVILLE, AL 35805 RODNEY BRADFORD TITLE: PORTABLE SOLAR POWERED WATER PURIFICATION AND DESALINATION SYSTEM DEVELOPMENT TOPIC: 8	DARPA	\$ 34,872
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THE OBJECTIVE OF THIS RESEARCH IS TO DETERMINE THE FEASIBILITY OF A LIGHT WEIGHT, COMPACT, DURABLE AND PORTABLE SOLAR POWERED WATER PURIFICATION AND DESALINATION SYSTEM WHICH HAS VERSATILE APPLICATIONS IN PRODUCING POTABLE WATER. THE BASIC TECHNOLOGY FOR THE COMPONENTS

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>OF SUCH SYSTEM IS AVAILABLE BUT HAS NOT BEEN INTEGRATED IN A MANNER TO PROVIDE A PRACTICAL, COST EFFECTIVE POTABLE WATER SOURCE FOR SPECIAL OPERATIONS, SMALL BOAT AND OTHER APPLICATIONS. A CANDIDATE CONCEPT THAT WILL BE ANALYZED AND TESTED ENTAILS AN INFLATABLE SPHERICAL VESSEL MADE OF THIN TRANSPARENT POLYMER FILM WHICH HAS A RELECTIVE COATING ON THE LOWER HALF WHICH SERVES AS A SOLAR RADIATION CONCEN- RATOR AND ALOS ON AIR-COOLED CONDENSER. AN ABSORBER/VAPORIZER CONSISTING OF INORGANIC CAPILLARY WICKING MATERIAL WHICH IS SATURATED WITH RAW FEED WATER WILL BE ASSESSED AS PART OF THIS CONCEPT. FEEDSTACK TO BE PROCESSED INCLUDES WATER WHICH MAY CONTAIN SEA WATER LEVELS OF SALINITY, BRACKISH ALKALINES, TEM- PORARY AND PERMANENT HARDNESS MINERALS, HIGH ORGANIC/BACTERIAL CON- CENTRATIONS AND MUD AND SILT.</p>		
SPECTRA RESEARCH SYSTEMS 555 SPARKMAN DRIVE, SUITE 1406 HUNTSVILLE, AL 35805 JOHN D. HYDE TITLE: APPLICATION OF INFRARED THERMOGRAPHY FOR THE DETECTION OF FATIGUE CRACKS IN MILITARY BRIDGES AND STRUCTURES TOPIC: 7s	ARMY	\$ 39,889
OFFICE: DRXMR-BRDC		

UNDER STEADILY REPEATED CYCLIC LOADING IMPOSED BY LIVE LOADS, FATIGUE CRACKS IN BRIDGES CAN BE INITIATED AT SMALL DEFECTS. BECAUSE DEFECTS CAN ELIMINATE THE INITIAL STAGE OF CRACK GROWTH, THE FATIGUE LIFE IS GREATLY REDUCED, ESPECIALLY IF FRACTURE IS CONTROLLED BY CRACK INITIA- TION. THEREFORE, THE FATIGUE CRACK GROWTH PROCESS IS REDUCED TO CRACK PROPAGATION AND UNSTABLE CRACK GROWTH. FATIGUE STUDIES INDICATE THAT WELDED COMPONENTS IN BRIDGES ARE MORE SUSCEPTIBLE TO FATIGUE FRACTURE THAN GIRDERS OR TRUSSES. DEFECTS FORMED DURING THE WELDING PROCESS ACT AS STRESS RISERS TO DEVELOP HIGH STRESS FIELDS WHICH LEAD TO MICROCRACKS AND SUBSEQUENT FAILURE UNDER CYLIC LOADING. SINCE CURRENT NDT TECHNIQUES FOR LOCATING CRACKS IN BRIDGES REQUIRE CONTACT AND SINCE MANY WELDED JOINTS ARE DIFFICULT TO INSPECT BECAUSE OF THE LOCA- TION, A TECHNIQUE WHICH WOULD BE NONCONTRACTING AND SIMPLY OPERATED IN FIELD ANALYSES UNDER TYPICAL, WORKING ENVIRONMENTS COULD SIMPLIFY THE ANALYSIS. THIS PROPOSED RESEARCH WILL INVESTIGATE THE FACTORS

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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NECESSARY TO DEVELOP A NEW AND INNOVATIVE TECHNIQUE USING INFRARED THERMOGRAPHY TO LOCATE CRACK PROPAGATION ZONES IN WELDED COMPONENTS.

SPECTRAN CORPORATION P.O. BOX 650, HALL ROAD STURBRIDGE, MA 01566 DR. RAYMOND E. JAEGER TITLE: STUDY OF PREPARATION TECHNIQUES FOR LARGE BULK FLUORIDE COMPONENTS TOPIC: 9c	AF	\$ 70,000
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OFFICE: RADC/ES

BULK GLASS COMPONENTS PREPARED FROM FLUORIDE GLASSES SUCH AS WINDOWS, LENSES AND DOMES EXHIBIT BROAD BAND LOW LOSS TRANSMISSION FROM NEAR UV TO MID IR WAVELENGTHS. THE GOALS OF THE PROGRAM ARE TO DEVELOP A REPRODUCEABLE PROCESS FOR THE PREPARATION OF HIGH PURITY FLUORIDE GLASSES IN BULK FORM. AN ADDITIONAL GOAL IS THE PREPARATION OF HIGH QUALITY DEVITRIFICATION FREE LARGE COMPONENTS ON THE ORDER OF 10CM IN DIAMETER BY 1.5CM THICK THAT EXHIBIT HIGH BROAD BAND SPECTRAL TRANSMISSION. THE GOALS WILL BE ACCOMPLISHED THROUGH THE PREPARATION OF DOPED FLUORIDE GLASSES IN A CONTROLLED ENVIROMENT USING A BARIUM, LANTHANUM, ALUMINUM, FLUOROZIRCONATE AS THE BASE COMPOSITION. APPROXIMATELY 24 EXPERIMENTAL MELTS WILL BE PREPARED IN A UNIQUELY DESIGNED CONTROLLED ATMOSPHERE CHAMBER. APPROXIMATELY 1,200 MAN HOURS WILL BE REQUIRED FOR SUCCESSFUL COMPLETION OF THE PROGRAM.

SPECTRAN CORPORATION P.O. BOX 650, HALL ROAD STURBRIDGE, MA 01566 JOHN M. STEVENS TITLE: DEVELOPMENT OF PROCEDURES FOR HERMETIC COATING OF OPTICAL FIBER USING ION DEPOSITION TOPIC: 9i	AF	\$ 69,990
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OFFICE: RADC/DORP

HERMETIC PROTECTION OF OPTICAL FIBER IS REQUIRED FOR MANY COMMUNICATIONS APPLICATIONS DUE TO THE DEGRADING EFFECTS OF MOISTURE ON THE LONG TERM STRENGTH OF GLASS. THE PRIMARY OBJECTIVE OF THIS PROGRAM IS TO EVALUATE VARIOUS MATERIALS FOR PLASMA DEPOSITION AS AN EFFECTIVE

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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TECHNIQUE FOR HERMETIC PROTECTION OF OPTICAL FIBER. COATINGS MATERIALS CONSIDERED FOR PERFORMANCE EVALUATION ARE CLASSIFIED AS DIELECTRICS AND METALLICS. SPECIFIC MATERIALS SELECTED FROM THESE CATEGORIES WILL BE DEPOSITED ON FIBER AS DRAWN FROM A CONVENTIONAL RESISTANCE FURNACE. THE COATING ASSEMBLY CONSISTS OF DIFFERENT COATINGS OF VARIOUS MATERIALS. THE FURNACE IS VACUUM INTERFACED TO THE COATING MODULE PROVIDING PROTECTION FROM ATMOSPHERE EXPOSURE PRIOR TO COATING DEPOSITION.

SPECTRON DEVELOPMENT LABORATORIES, INC.	AF	\$ 49,953
3303 HARBOR BLVD., SUITE G-3		
COSTA MESA, CA 92626		
JAMES D. TROLINGER		

TITLE:

DEVELOPMENT OF HOLOGRAPHIC PARTICLE FIELD DATA REDUCTION BY FOURIER ANALYSIS

TOPIC: 13c

OFFICE: AFWAL/XRP-PO

HOLOGRAPHY IS ONE OF THE MOST POWERFUL DIAGNOSTIC TOOLS FOR DYNAMIC THREE DIMENSIONAL PARTICLE FIELDS IN EXISTENCE; HOWEVER, ITS UTILITY HAS BEEN EXTREMELY RESTRICTED BECAUSE DATA REDUCTION IS EXTREMELY TEDIOUS. DURING RECENT YEARS, DEVELOPMENTS IN FOURIER TRANSFORM TECHNIQUES HAVE PROVIDED A POSSIBLE METHOD TO SOLVE THIS PROBLEM. THE TECHNIQUES HAVE ALREADY BEEN DEVELOPED IN COMMERCIAL LIGHT SCATTERING PARTICLE SIZERS. THIS IS A PROPOSAL TO DEVELOP THE TECHNIQUES FOR USE IN FAST HOLOGRAM DATA REDUCTION.

SPECTRON DEVELOPMENT LABORATORIES, INC.	DARPA	\$ 52,975
3303 HARBOR BLVD., SUITE G-3		
COSTA MESA, CA 92626		
J. L. DOTY, PH.D.		

TITLE:

AN ELECTRO-OPTIC SPATIAL LIGHT MODULATOR FOR THERMOELASTIC GENERATION OF PROGRAMABLY FOCUSED ULTRASOUND

TOPIC: 4

OFFICE: DARPA

THE CONCEPT PROPOSED IS AN ELECTRO-OPTIC TECHNIQUE THAT WOULD MAKE IT POSSIBLE TO SPATIALLY MODULATE A HIGH POWER PULSED LASER BEAM TO THERMOELASTICALLY INDUCE FOCUSED ULTRASOUND IN A TEST MATERIAL. BEING A PURELY ELECTRO-OPTIC DEVICE, THE MODULATOR, AND THEREFORE THE DEPTH

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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AT WHICH THE ACOUSTIC FOCUS OCCURS, CAN BE PROGRAMMED ELECTRONICALLY AT ELECTRONIC SPEEDS. IF SUCCESSFUL, IT WOULD BECOME POSSIBLE TO SCAN A SOUND CONTINUOUSLY IN THREE DIMENSIONS WITHIN THE COMPONENT OR STRUCTURE UNDER TEST.

SPIRE CORPORATION PATRIOTS PARK BEDFORD, MA 01730 ROBERT WOLFSON TITLE: CUBIC BORON NITRIDE ENVIRONMENTAL PROTECTIVE COATINGS FOR OPTICAL DISKS TOPIC: 9e	AF	\$ 49,956
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OFFICE: RADC/DORP

ADVANCES IN WIDEBAND COMMUNICATIONS AND INFORMATION HANDLING TECHNOLOGIES HAVE CREATED A DATA STORAGE AND RETRIEVAL PROBLEM WHICH WILL NO LONGER BE SATISFIED BY EVOLUTIONARY IMPROVEMENTS OF CONVENTIONAL TECHNOLOGIES. THE USE TELLURIUM COATED OPTICAL STORAGE DISKS FOR ABLATIVE RECORDING IS ONE OF THE MOST PROMISING APPROACHES TO THIS PROBLEM SINCE BANDWIDTH CAPABILITY AND STORAGE CAPACITY WOULD BOTH BE IMPROVED BY MANY ORDERS OF MAGNITUDE. (1) THE TENDENCY OF TELLURIUM FILMS TO OXIDIZE, HOWEVER, LIMITS THEIR USE UNLESS A SUITABLE PROTECTIVE COATING CAN BE FOUND. HARD TRANSPARENT CARBON FILMS HAVE BEEN ATTEMPTED, BUT TELLURIUM FILM DAMAGE AND VERY SLOW DEPOSITION RATES LIMIT THIS APPROACH. (5) IT IS ANTICIPATED THAT A CUBIC BORON NITRIDE HERMETIC COATING APPLIED WITH SPIRE'S HIGH DEPOSITION RATE PLASMA ION EQUIPMENT WILL PROVIDE THE REQUIRED ARCHIVAL PROTECTION, IN A COST EFFECTIVE MANNER, WITH MINIMAL DAMAGE TO THE TELLURIUM LAYER.

SPRINGBORN LABORATORIES, INC. 10 SPRINGBORN CENTER ENFIELD, CT 06082 MR. W. R. DIEHL TITLE: INJECTION MOLDING TECHNIQUES FOR OPTICAL QUALITY MOLDINGS TOPIC: 4	AF	\$ 49,968
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OFFICE: AMD/RDO

A PHASE I PROGRAM IS PROPOSED TO ESTABLISH INJECTION MOLDING TECHNIQUES AND PARAMETERS FOR MOLDING OPTICAL QUALITY PARTS FROM OPTICAL QUALITY ACRYLIC AND OLYCARBONATE MOLDING MATERIALS FROM DOMESTIC COMMERCIAL SOURCES, USING AN UPGRADED EXISTING MOLD. MOLDING MACHINE

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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CONDITIONS FOR PRODUCING HIGH OPTICAL QUALITY PROPERTIES CONSISTENTLY AND REPRODUCIBLY WILL BE SOUGHT. MOLDINGS WILL BE TESTED FOR OPTICAL QUALITY AS MOLDED AND STORAGE AT AMBIENT AND ELEVATED TEMPERATURES. THIS PHASE I PROGRAM IS EXPECTED TO LEAD TO A PHASE II PROGRAM TO DESIGN, BUILD AND OPERATE A MOLD FOR MAKING PARABOLIC OR TOROID-SHAPED VISORS, INCLUDING A SUFFICIENT NUMBER OF VISORS TO PERMIT FIELD EVALUATION. IN PHASE III, WITH THE DOCUMENTED OPERATING TECHNOLOGY DEVELOPED IN PHASE II, WE WILL COOPERATE WITH ONE OR MORE QUALIFIED MOLDERS TO PRODUCE VISORS IN QUANTITY.

SRL ELECTRONICS & INFOTEC DEVEL, INC. 26712 WESTVALE ROAD PALOS VERDES PENN, CA 90274 SCOTT ANDERSON TITLE: SPACEBORNE MASS STORAGE DEVICES: DEVELOPMENT OF A SOLID STATE (BUBBLE MEMORY) RECORDER TOPIC: 14g	AF	\$ 70,000
OFFICE: SD/YLXT		

TAPE RECORDERS PRESENTLY USED AS SPACEBORNE MASS STORAGE DEVICES HAVE A HISTORY OF BEING UNRELIABLE AND REQUIRE EXTENSIVE AND COSTLY GROUND TESTING TO PROVIDE THE CONFIDENCE NECESSARY TO PASS LAUNCH READINESS. EVEN THEN THEY DO NOT ALWAYS ADEQUATELY PERFORM THEIR FUNCTION ON ORBIT. THE OBJECTIVE OF THIS PHASE I PROGRAM IS TO DEVELOP A BUBBLE MEMORY MODULE WHICH CAN BE USED AS A BUILDING BLOCK FOR THE ASSEMBLY OF SPACEBORNE RECORDERS THAT CAN REPLACE TAPE RECORDERS. CONCEPTUAL DESIGNS WILL BE DEVELOPED FOR MEMORY MODULES COMPOSED OF ONE TO EIGHT MAGNETIC BUBBLE UNITS. THE CONCEPT WHICH BEST SATISFIES THE DESIGN REQUIREMENTS WILL BE BREADBOARDED AND TESTED USING THE INTEL 4 MEGABIT MAGNETIC BUBBLE.

SSG, INC. 150 BEAR HILL ROAD WALTHAM, MA 02154 DEXTER WANG TITLE: OPTICAL SIGNATURE SIMULATOR TOPIC: 8j	ARMY	\$ 49,615
OFFICE: BMDSC-CPP		

THE PROPOSED DEVICE USES A PROGRAMMED MOSAIC OF HEATER ELEMENTS TO DEVELOP INFRARED SIGNATURES. DYNAMIC SCENES AND MOVING TARGETS CAN BE SIMULATED. THE DEVICE USES TECHNOLOGIES WHICH ARE DERIVATIVES OF ADVANCED FOCAL PLANE ARRAY TECHNOLOGIES. RESISTIVE MATERIAL IS

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
DEPOSITED ON THIN BOARDS, DELINEATED, CIRCUIT CONNECTION MADE USING PRINTED CIRCUIT BOARD TECHNIQUES, AND THE BOARDS ARE ASSEMBLED INTO A MOSAIC. CONTROL IS OBTAINED WITH MUTIPLEXED READOUT AND DRIVER.		

STAM INC. 885 WATERMAN AVENUE E. PROVIDENCE, RI 02914 DR.A MANDAYAM C. NARASIMH TITLE: SEA WATER BATTERIES TOPIC: D41a	DARPA	\$ 65,700
OFFICE: DARPA		

THIS PROPOSAL DESCRIBES A PROGRAM FOR THE DEVELOPMENT OF SUPERIOR SEA WATER BATTERIES INCORPORATING RAPIDLY SOLIDIFIED AMORPHOUS PALLADIUM-SILICON CATHODES AND RAPIDLY SOLIDIFIED CRYSTALLINE ALUMINUM ALLOY ANODES. THE SEA WATER BATTERY PERFORMANCE WILL BE EVALUATED AND THE CORROSION CHARACTERISTICS OF THE ANODE WILL BE CORRELATED WITH THE MICROSTRUCTURE AND ALLOY COMPOSITION OF THE ANODE MATERIAL. THE ALLOY AND PROCESS CONDITION WILL BE OPTIMIZED TO DEMONSTRATE SUPERIOR SEA WATER BATTERY HAVING HIGHER OPEN CIRCUIT VOLTAGE AND SUPERIOR DISCHARGE CHARACTERISTICS. OPTIMUM BATTERY DESIGN WILL BE CARRIED OUT DURING PHASE II TO DEVELOP A PERMANENT CATHODE/REPLACABLE CARTRIDGE ANODE ALLOY STACK SEA WATER BATTERY.

STANDARD MANUFACTURING CO., INC. POST OFFICE BOX 210300 DALLAS, TX 75211 R. J. SCHWARZ TITLE: REMOTE OPERATED MEDICAL SUPPORT VEHICLE TOPIC: 5L	ARMY	\$ 95,514
OFFICE: SGRD-MRDC		

THIS PROPOSAL SHALL BE FOR A STUDY TO PROVIDE A COMPREHENSIVE EXAMINATION OF THE EXTENDED USE, FEASIBILITY AND ADVANTAGES THAT COULD BE REALIZED BY THE USE OF A REMOTE CONTROL/MEDICAL SUPPORT VEHICLE. THE STUDY SHALL RELATE KNOWN AND EXPECTED CONDITIONS AND PARAMETERS

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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WHICH SHOULD LOGICALLY GUIDE A DESIGN/TRADE-OFF PHASE TO PLAUSIBLE CONCLUSIONS OF WHAT SUCH A VEHICLE COULD ACTUALLY PERFORM.

THE SUBJECT OF THE STUDY WILL BE TO IDENTIFY SPECIFIC ADVANTAGES WITH A REMOTELY CONTROLLED VEHICLE, HOW THE VEHICLE SHOULD BE CONFIGURED AND THE VEHICLE'S IMPORTANCE IN RELATION TO FORSEEABLE FUTURE BATTLEFIELD CONDITIONS.

SUMX CORPORATION	ARMY	\$ 49,834
2211 DENTON DRIVE, PO BOX 14864		
AUSTIN, TX 78761		
DAVID W. DEBERRY, PH.D.		
TITLE:		
INNOVATIVE ELECTROACTIVE COATINGS FOR CORROSION PROTECTION		
TOPIC: 7k	OFFICE: DRDME-BRDC	

SUMX CORPORATION HAS DEVELOPED AND DEMONSTRATED CONCEPTUALLY NEW COATINGS FOR CORROSION PROTECTION. THE CORROSION RESISTANCE AFFORDED BY THIS METHOD IS BASED ON ELECTRON TRANSFER BETWEEN THE METAL AND IMMOBILIZED REDOX CENTERS IN THE COATING SO AS TO MAINTAIN THE METAL IN A PASSIVE CONDITION. THIS "PINNING" OF THE SUBSTRATE POTENTIAL MAY PROVIDE PROTECTION AGAINST LOCALIZED, AS WELL AS UNIFORM CORROSION MODES. IN THE PROPOSED WORK, SUMX INTENDS TO ADAPT THE ELECTROACTIVE COATING METHOD TO RELATIVELY LOW CHROMIUM CONTENT 400 SERIES STAINLESS STEELS. THE BEHAVIOR OF THESE COATED MATERIALS WOULD THEN BE STUDIED IN RANGE OF ENVIRONMENTS. THEIR RESISTANCE TO BOTH UNIFORM AND LOCALIZED CORROSION WILL BE CHALLENGED. THE RESULTS OF THE PROGRAM CAN BE USED TO ESTIMATE THE SAVING IN STRATEGIC MATERIALS OBTAINABLE BY REPLACING CONVENTIONAL STAINLESS STEELS WITH ELECTROACTIVE COATED ONES IN CORROSIVE APPLICATIONS. THE COATED MATERIALS MAY ALSO BE MORE RESISTANT TO STRESS CORROSION CRACKING THAN CONVENTIONAL STEELS. THIS POSSIBILITY WOULD BE EVALUATED IN THIS PROGRAM AND THOROUGHLY TESTED IN PHASE II WORK.

SUMX CORPORATION	DARPA	\$ 48,697
2211 DENTON DRIVE, PO BOX 14864		
AUSTIN, TX 78761		
DR DAVID W. DEBERRY		
TITLE:		
LIGHT ADDRESSABLE ELECTROCHROMIC DISPLAY		
TOPIC: 3	OFFICE: DARPA-PMO	

SUMX CORPORATION HAS DEVELOPED A NEW PHOTOELECTROCHROMIC IMAGING SYSTEM EMPLOYING A THIN FILM OF PRUSSIAN BLUE ON SINGLE CRYSTAL AND POLYCRYSTALLINE SEMICONDUCTOR ELECTRODES. THE FABRICATION OF THE ELECTROCHROMIC MATERIAL INVOLVES THE ELECTROCHEMICAL DEPOSITION OF A

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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THIN IMMOBILIZED SURFACE FILM. THESE PRUSSIAN BLUE COATINGS EXHIBIT EXCELLENT REVERSIBILITY, CYCLE STABILITY, COLOR CONTRAST BETWEEN THE OXIDIZED AND REDUCED FORMS, AND RAPID ELECTROCHROMIC SWITCHING RESPONSE. THE SEMICONDUCTOR ELECTRODE IN THIS SYSTEM PERMITS USING AN ANODICALLY FORMED TiO_2 ELECTRODE UNDER APPROPRIATE BIAS AND ILLUMINATION WITH LIGHT HAVING ENERGY GREATER THAN THE SEMICONDUCTOR BANDGAP. THE IMAGE THUS FORMED REMAINS STABLE AT OPEN-CIRCUIT AND RAPIDLY ERASED BY REVERSE BIAS. THE FAST CHARGE TRANSPORT AND MAINTENANCE OF THE ELECTROCHROMIC FILM NEUTRALITY INVOLVES A CATIONIC DIFFUSION PROCESS THROUGH THE ZEOLITIC CHANNELS WITHIN THE FILM. THE PROPOSED EFFORT IS DIRECTED TOWARD THE DEVELOPMENT OF A FLAT-PANEL LIGHT WRITING DISPLAY THAT WILL EVENTUALLY LEAD TO THE CONSTRUCTION OF A COMPLEX MATRIX-TYPE USER INTERACTIVE DEVICE.

SUMX CORPORATION P.O. BOX 14864, 221 DENTON DRIVE AUSTIN, TX 78761 DAVID W DEBERRY TITLE: ELECTROCHEMICALLY ACTIVE COATINGS FOR CORROSION PROTECTION TOPIC: 100	NAVY	\$ 49,834
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SUMX HAS DEMONSTRATED CONCEPTUALLY NEW COATINGS FOR CORROSION PROTECTION WHICH MAINTAIN METALS IN A PASSIVE CONDITION DUE TO ELECTRON TRANSFER BETWEEN METALS AND IMMOBILIZED REDOX CENTERS IN COATINGS. "PINNING" OF SUBSTRATE POTENTIAL PROTECTS AGAINST BOTH LOCALIZED AND UNIFORM CORROSION. SINCE THESE COATINGS PROTECT ELECTROCHEMICALLY THE REDOX COUPLES IN THE COATINGS, THEY ARE MORE EFFECTIVE THAN CONVENTIONAL COATING INHIBITORS IN USING ADSORPTION. SUMX COATINGS HAVE AN ENHANCED CAPABILITY TO TOLERATE PINHOLES, HOLIDAYS, AND COATING RUPTURES. IN PHASE I, SUM WILL TEST ADHESION AND CORROSION IN ACIDIC AND CHLORIDE-CONTAINING SYSTEMS. PHASE I WILL BE RESTRICTED TO IRON AND STAINLESS STEELS TO ESTABLISH COATINGS FEASIBILITY. (PHASE II WILL RESEARCH TO AL AND TI ALLOYS AND DETAILED COATINGS FORMULATIONS.) COATED MATERIALS WILL BE STUDIED IN A RANGE OF ENVIRONMENTS. COATED METALS SHOULD BE MORE RESISTANT TO STRESS CORROSION CRACKING THAN CONVENTIONAL STEELS. WITH THE COATINGS, IT SHOULD BE POSSIBLE TO USE LESS EXPENSIVE AND MORE COMMON METALS THAN

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
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NORMALLY FOUND IN CORROSION ENVIRONMENTS. COATED METALS SHOULD SIGNIFICANTLY INCREASE PROTECTION AGAINST CREVICE CORROSION, CATASTROPIC FAILURES, CORROSION AT GAS/LIQUID INTERFACES, AND CORROSION IN VARYING ENVIRONMENTS.

SUNPOWER, INC. 6 BYARD STREET ATHENS, OH 45701 DAVID BERCHOWITZ TITLE: DESIGN OF A 1.5 KW PORTABLE, ELECTRIC GENERATOR TOPIC: 7b	ARMY	\$ 89,538
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THE EXPERIENCE GAINED FROM THE DESIGN AND OPERATION OF TWO PREVIOUS PROTOTYPES WILL BE USED AS THE BASIS FOR THE SYSTEM DESIGN AND PERFORMANCE EVALUATION OF A THIRD GENERATION FREE-PISTON STIRLING LINEAR ALTERNATOR SYSTEM CAPABLE OF RELIABLY PRODUCING 1.5 kw OF 60Hz 120 VAC SINGLE PHASE POWER OR 1.4kw OF DC POWER AT 12 OR 28 VOLTS. THE MACHINE WILL BE ABLE TO USE ANY AVAILABLE LIQUID FUEL, WILL BE HERMETICALLY SEALED, AIR COOLED AND RUGGED. ITS EXPECTED CHARACTERISTICS ARE: WEIGHT (EMPTY) 35 kg, SIZE 70X30x45 cm (FIELD PACKAGE), FUEL LOAD 10 LITERS FOR BETTER THAN 12 HOURS OPERATION. COST IN COMMERCIAL PRODUCTION IS APPROXIMATELY \$800. IT WILL REQUIRE ONLY ROUTINE MAINTENANCE OF THE BURNER (CLEANING) AND WILL BE STARTED BY CLOSING AN IGNITION SWITCH OR DEPRESSING A STARTER BUTTON. POWER CONDITIONING WILL BE AUTOMATIC WITH ANY LOAD FROM ZERO TO 1.5 kw. OVERLOADS OR SHORT CIRCUITED LOAD WILL DESTROY THE SYSTEM.

SYNERGY SYSTEMS 2022 AVE. A KEARNEY, NE 68847 DR DAVID L SALLACH TITLE: EXPERT SYSTEMS THROUGH A UNIVERSAL KNOWLEDGE FRAME TOPIC: 5k	ARMY	\$ 49,000
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THE PROJECT WILL ASSESS SEVERAL DESIGN ALTERNATIVES IN THE DEVELOPMENT OF EXPERT SYSTEMS AND, MORE GENERALLY, MACHINE INTELLIGENCE. SPECIFICALLY, A UNIVERSAL KNOWLEDGE FRAME WILL BE EVALUATED AS A MEANS OF:

- 1) REDUCING THE AD HOC NATURE OF THE KNOWLEDGE BASE OF EXPERT SYSTEMS,

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>2) FACILITATING THE PRODUCTION OF NEW EXPERT SYSTEMS, 3) PERMITTING THE INTERACTION OF EXPERT SYSTEMS FROM WITHIN THEIR DISTINCTIVE DOMAINS, AND 4) ALLOWING FOR MORE ROBUST SEMANTIC PROCESSING CAPABILITY. A LIMITED PROTOTYPE OF THE UNIVERSAL KNOWLEDGE FRAME WILL BE IMPLEMENTED THROUGH A RELATIONAL DATABASE (EXTENDED TO SUPPORT SEMANTIC DATA MODELING) COUPLED WITH RULE-BASED CONTROL MECHANISMS DEFINED IN PROLOG. EACH OF THE IMPLEMENTATIONAL TECHNIQUES WILL BE ASSESSED, AND THE TERMS OF PRACTICAL SOFTWARE DEVELOPMENT POTENTIAL.</p>		

SYNTRO CORPORATION 11095 TORREYANA ROAD, SUITE 103 SAN DIEGO, CA 92121 RONALY D BROWN TITLE: BIOLOGICALLY PRODUCED MACRO-MOLECULES FOR AVIATION MATERIALS TOPIC: 98	NAVY	\$ 49,980
OFFICE: NASC		

SYNTRO CORPORATION HAS DEVELOPED THE MEANS OF CONSTRUCTING ARTIFICIAL GENES, AND FOR THE EXPRESSION OF THESE GENES AS MACRO-MOLECULES IN BACTERIA. THE CORPORATION PROPOSES TO PERFECT THIS TECHNOLOGY AND USE IT FOR THE INEXPENSIVE, LARGE-SCALE PRODUCTION OF A POLYMER SUITABLE FOR FORMING FIBERS AND FILMS WITH NOVEL CHARACTERISTICS.

SYSTEMS ENGINEERING FOR POWER, INC. 4300 EVERGREEN LANE #302 ANNANDALE, VA 22003 BOZIDAR AVRAMOVIC TITLE: MODELING AND CONTROL OF LARGE SPACE STRUCTURES TOPIC: 1a	AF	\$ 59,994
OFFICE: AFOSR/XOT		

THIS RESEARCH SHALL FOCUS ON TWO IMPROVEMENTS TO THE CURRENT STATE OF MODELING AND SHAPE CONTROL OF LARGE SPACE STRUCTURES: (i) THE USE OF FREQUENCY DOMAIN-SPECTRAL FACTORIZATION METHODS FOR THE DEVELOPMENT OF SHAPE CONTROL LAWS: AND (ii) THE USE OF ADVANCED METHODS, INCLUDING

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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HOMOGENIZATION, OR THE REDUCTION OF COMPLEXITY OF THE MODELS OF LARGE SPACE STRUCTURES WITH REGULAR LATTICE STRUCTURE. THE APPROACH WILL BE TO ADAPT SOME PROVEN ALGORITHMS OF DAVIS AND STINGER FOR OPTIMAL GAIN COMPUTATION BY SPECTRAL FACTORIZATION TO A GENERIC MODEL OF A LARGE, FLEXIBLE STRUCTURE. IN THE SECOND PART OF THE WORK WE SHALL ASSESS RELEVANCE OF HOMOGENIZATION ASYMPTOTIC ANALYSIS TO THE SIMPLIFICATION OF MODELS OF SOME TYPICAL LARGE, LATTICE STRUCTURES PLANNED FOR SPACE APPLICATIONS.

SYSTEMS TECHNOLOGY, INC. 13766 SOUTH HAWTHORNE BLVD. HAWTHORNE, CA 90250 WARREN F. CLEMENT TITLE: USER'S GUIDE AND DATA BASE FOR HEAD-UP DISPLAY CONTENT FORMAT, AND SYMBOLGY TOPIC: 19a	AF	\$ 49,388
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ALTHOUGH ORIGINALLLY DEVELOPED FOR WEAPON AIMING PURPOSES, THE HEAD-UP DISPLAYS (HUDS) HAVE EVOLVED TO INCLUDE SYMBOLIC CONTENT FOR TASKS WHICH DEMAND PRECISION FLIGHT CONTROL UNDER INSTRUMENT CONDITIONS AS WELL AS VISUAL CONDITIONS. TO PROVIDE THE PILOT WITH USEABLE CUES FOR SAFE, PRECISE INSTRUMENT FLIGHT, EXTREME CARE MUST BE TAKEN IN THE SELECTION OF THE DISPLAY CONTENT, THE DISPLAY FORMAT, THE SYMBOL DYNAMICS, HOW THE INTEGRITY OF THE DISPLAY CAN BE MONITORED, AND HOW THE PILOT IS ADVISED OF DISPLAY MALFUNCTIONS. IN SPITE OF THE APPARENT DISARRAY AMONG HUD STANDARDS FOR SYMBOLGY, THERE EXISTS A MEHTODICAL TECHNICAL APPROACH*, DISCLOSED HEREIN, FOR RESTORING A SEMBLANCE OF ORDER TO DEFINITIONS AND STANDARDS OF DISPLAY CONTENT AND FORMAT FOR HUD. THIS TECHNICAL APPROACH EMPLOYS CLOSED-LOOP ANALYSIS OF THE PILOT'S TASKS ASSOCIATED WITH A SPECIFIC VEHICLE OPERATIONAL PROFILE OR MISSION PHASE. THE RESULTING MULTI-LOOP FEEDBACK (AND FEEDFORWARD) STRUCTURES REVEAL, IN DETAIL NOT ONLY THE CONTENT, FORMAT, AND DYNAMIC PROPERTIES OF ESSENTIAL PILOT INFORMATION REQUIREMENTS BUT ALSO APPROPRIATE PILOTING CONTROL TECHNIQUES, WHICH CAN BE HELPFUL IN TRAINING.

*WE PROPOSE TO OFFER THIS TECHNICAL APPROACH FOR ADDRESSING THE PROBLEM OF PROLIFERATION OF SYMBOLGY AND TERMINOLOGY FOR HUD POSED

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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BY THE AIR FORCE AERONAUTICAL SYSTEMS DIVISION.

SYSTEMS TECHNOLOGY, INC. .3766 S. HAWTHORNE BLVD. HAWTHORNE, CA 90250 R. WADE ALLEN TITLE: MISSION-ORIENTED DECISION AND CONTROL PILOT MODEL TOPIC: 10c OFFICE: AFWAL/XRPF	AF	\$ 49,999
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PROPOSED IS THE DEVELOPMENT OF A MULTI-STAGE DECISION AND CONTROL MATHEMATICAL MODEL OF PILOT/VEHICLE INTERACTION THAT CAN BE USED IN CONCEPTUAL STUDIES, PRELIMINARY DESIGN, FLYING QUALITIES RESEARCH, PROBLEM ANALYSIS, FLIGHT SAFETY, HUMAN ERROR AND RELIABILITY ASSESSMENTS, ETC. THE PROPOSED MODEL EMPHASIZES DECISION MAKING, MONITORING, AND SUPERVISION, AS WELL AS DISCRETE AND CONTINUOUS CONTROL. IT WILL INCLUDE CONSIDERATION OF REALISTIC MISSION SCENARIOS AND FLIGHT TASKS, AND LARGE AMPLITUDE MOTIONS WITH TIME-VARYING AND NON-LINEAR DYNAMICS. THE PHASE I EFFORT WILL INCLUDE MODEL FORMULATION AND ANALYSIS (USING AS A SPECIFIC CONCRETE EXAMPLE THE APPROACH AND LANDING MISSION PHASE), AND RECOMMENDATION FOR PHASE II. SUBSEQUENT PHASE II WORK WOULD INCLUDE THE IMPLEMENTATION OF DETAILED ANALYTICAL/COMPUTATIONAL PROCEDURES, AND MODEL ANALYSIS OF A VARIETY OF SPECIFIC SITUATIONS.

SYSTOLIC SYSTEMS, INC. 1408 PETAL WAY SAN JOSE, CA 95129 R. H. TRAVASSOS/C. LEE TITLE: DEVELOPMENT OF AN AIRCRAFT FLIGHT TECHNOLOGY RESEARCH SYSTEM TOPIC: 10c OFFICE: AFWAL/XRPF	AF	\$ 54,941
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TO MEET THE EXCEPTIONALLY HIGH THROUGHPUT REQUIREMENTS OF DoD STRATEGIC/TACTICAL AIRCRAFT IN THE 1990'S, IT IS NECESSARY TO DEVELOP HIGHLY PARALLEL (OR DISTRIBUTED) FLIGHT CONTROL SYSTEMS. BECAUSE THE COMPUTER ARCHITECTURES OF SUCH SYSTEMS TEND TO BE PROBLEM DRIVEN TO ACHIEVE THE

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>NECESSARY THROUGHPUT, A DISTRIBUTED FLIGHT CONTROL SYSTEM IS PROPOSED THAT MAY BE RECONFIGURED TO EVALUATE THE PERFORMANCE OF ALTERNATIVE MULTIPROCESSOR FLIGHT CONTROL ALGORITHMS AND ARCHITECTURES. SUCH A TESTBED FACILITY IS LARGELY UNAVAILABLE IN AEROSPACE RESEARCH LABORATORIES AND INDUSTRY WHERE SIGNIFICANT RESOURCES ARE STILL EXPENDED TO DEVELOP SPECIALIZED HARDWARE AND SOFTWARE. THE PROPOSED RESEARCH DEVELOPS A REAL-TIME AIRCRAFT FLIGHT CONTROL FACILITY BY INTEGRATING STATE OF THE ART VLSI HARDWARE WITH THE DOD ADA PROGRAMMING LANGUAGE. THE TESTBED FACILITY MAY BE USED TO PROVE REAL TIME AIRCRAFT FLIGHT CONTROL CONCEPTS IN THE LABORATORY.</p>		

SYSTRAN CORPORATION 4126 LINDEN AVENUE DAYTON, OH 45432 JOHN JURGENSEN TITLE: PROPOSAL TO INVESTIGATE COMBAT AID TO PILOTS BY EXPERT SYSTEMS TOPIC: 12e	AF	\$ 69,999
OFFICE: AFWAL/AAA		

THIS ESTABLISHES THE MOST FRUITFUL POTENTIAL APPLICATIONS OF ARTIFICIAL INTELLIGENCE/EXPERT SYSTEM TECHNOLOGY IN AIDING THE COMBAT TACTICAL FIGHTER PILOT. THE PROJECT WILL IDENTIFY THOSE TASKS WHICH MAY BE ACCOMPLISHED IN A SIGNIFICANTLY IMPROVED MANNER GIVEN THE AID OF AN EXPERT SYSTEM. THE PROJECT WILL INVESTIGATE THE APPLICABILITY OF CURRENT EXPERT SYSTEMS TO THE PROBLEM AND WILL IDENTIFY DEVELOPMENT EFFORTS THE AIR FORCE SHOULD CONSIDER IN THIS FIELD. THE MOST PROMISING MAN-MACHINE INTERFACES FOR COMBAT FIGHTER USE OF AN EXPERT SYSTEM WILL BE IDENTIFIED.

TAYLOR & ASSOCIATES, INC. P.O. BOX 1547 WRIGHTWOOD, CA 92397 THOMAS C. TAYLOR TITLE: PERFORMANCE ENHANCEMENT OF THE SPACE TRANSPORTATION SYSTEM TOPIC: 14	AF	\$ 62,018
OFFICE: AFWAL/XRPF		

AN OPPORTUNITY EXISTS FOR RESEARCH INTO A CONCEPT WHICH IS LIKELY TO CONTRIBUTE TO THE REDUCTION OF AERODYNAMIC DRAG AND HEATING ON THE ASCENT PHASE OF THE SPACE TRANSPORTATION SYSTEM (SPACE SHUTTLE). THE PERFORMANCE ENHANCEMENT POTENTIALLY AVAILABLE FROM THIS RESEARCH

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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SCENARIO MAY BE MORE COST EFFECTIVE THAN OTHER PRESENTLY FUNDED PERFORMANCE ENHANCEMENT OPTIONS. THE RESEARCH MAY ALSO REDUCE THE "MAX. Q" LOCATION AND DESIGN LOADS. THIS MAY IMPACT PRESENT AND FUTURE LAUNCH VEHICLE DESIGN.

TECHNICAL RESEARCH ASSOCIATES, INC. 420 CHIPETA WAY, SUITE 100 SALT LAKE CITY, UT 84108 GUY B. ALEXANDER TITLE: NEW METALLOPHILIC COLLOIDAL CERAMICS TOPIC: 1a	AF	\$ 52,078
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THE BENEFITS OF DISPERSION HARDENING MATERIALS LIKE NICKEL WITH OXIDES LIKE THORIA HAS BEEN KNOWN FOR A LONG TIME. HOWEVER, OXIDES ARE NOT WET BY METALS, SO WHEN OXIDE DISPERSION HARDENED METALS ARE MELTED, THE DISPERSED OXIDE SEPARATES AS A SLAG AND THE ADVANTAGES OF DISPERSION HARDENING ARE LOST. IN THIS PROPOSAL, A NEW APPROACH TO OXIDE DISPERSION HARDENING IS SUGGESTED, THROUGH THE USE OF METALLOPHILIC COLLOIDAL OXIDE PARTICLES. SPECIFICALLY, A FUNDAMENTAL STUDY OF WETTING OF OXIDES BY METALS IS PROPOSED. A NEW COLLOIDAL CERAMIC WETTABLE BY METALS IS ANTICIPATED. THIS PROPOSAL SUGGESTS THE INTRODUCTION OF SUCH NEW CERAMIC PARTICLES INTO MOLTEN METALS LIKE ALUMINUM. DISPERSION HARDENED ALUMINUM ALLOYS WHICH CAN BE CAST ARE EXPECTED.

TECHNICAL RESEARCH ASSOCIATES, INC. 420 CHIPETA WAY, SUITE 100 SALT LAKE CITY, UT 84108 BRENT K. BAILEY TITLE: MATHEMATICAL MODELING OF ALTERNATE DIESEL FUEL PERFORMANCE TOPIC: 7c	ARMY	\$ 16,213
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IN ORDER TO QUANTITATIVELY IDENTIFY THE CONTRIBUTION OF SEVERAL CRITICAL FUEL PROPERTIES TO IGNITION, COMBUSTION AND SUBSEQUENT ENGINE PERFORMANCE OF ALTERNATE DIESEL FUELS, AN EMPIRICAL MATHEMATICAL MODELING INVESTIGATION IS PROPOSED. THE PERFORMANCE OF A WIDE VARIETY

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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OF ALTERNATE HYDROCARBON DIESEL FUELS IN A DETROIT DIESEL SERIES 53 ENGINE WILL BE EVALUATED. FUEL PROPERTIES TO BE EVALUATED WILL INCLUDE IGNITION QUALITY, DENSITY, VISCOSITY, VOLATILITY AND CHEMICAL COMPOSITION. THESE FUEL PROPERTIES WILL BE MODELED TO GENERATE A PREDICTIVE CORRELATION OF BRAKE HORSEPOWER AND SPECIFIC CONSUMPTION PERFORMANCE.

TECHNICAL RESOURCES, INC 10215 FERNWOOD ROAD, SUITE 408 BETHESDA, MD 20817 ANDY C CHEN TITLE: DEVELOPMENT OF A NEW TYPE OF RADAR ABSORBING MATERIAL TOPIC: 12	NAVY	\$ 45,165
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OFFICE: NSSC

A NOVEL NEW CONCEPT TO DEVELOP AN INEXPENSIVE AND EFFECTIVE RADAR ABSORBING MATERIAL (RAM) IS PROPOSED HERE IN RESPONSE TO THE NAVY'S SBIR PROGRAM SOLICITATION. THE CONCEPT IS TO UTILIZE CROSS-LINKED ABSORBENT POLYMERIC BEADS AS A NEW TYPE OF RAM. CROSS-LINKED POROUS POLYMERIC BEADS ARE HOLLOW MICROSPHERES WITH THREE-DIMENSIONAL NETWORK WHICH CAN ABSORB ELECTROMAGNETIC WAVE ENERGY AND DISSIPATE THE ENERGY WITHIN THE THREE-DIMENSIONAL NETWORK CAGE. POLYMERIC BEADS WILL BE SYNTHESIZED WITH SUSPENSION POLYMERIZATION TECHNIQUES. VARIOUS MONOMERS, CO-MONOMERS, AND CROSS-LINKING AGENTS WILL BE EXAMINED TO TEST THE TECHNICAL FEASIBILITY. IMPORTANT PROPERTIES SUCH AS HEAT-RESISTANCY, THERMAL STABILITY, CHEMICAL-RESISTANCY, TENSILE STRENGTH, PROCESSIBILITY, PARTICLE SIZE EFFECT WILL ALSO BE EXAMINED TO OPTIMIZE MATERIAL SELECTION PROCESS. THE TOP THREE TO FIVE PROMISING CANDIDATES WILL BE IDENTIFIED AND SELECTED IN THE END OF PHASE I WORK FOR LABORATORY TESTING AND EVALUATION. TRI IS COMMITTED TO FOLLOW ON AND TO IMPLEMENT ALL THE REQUIREMENTS FOR SUCCESSFUL COMMERCIALIZATION FOR PROMISING CANDIDATES IDENTIFIED IN PHASE I.

TECHNOLOGY FOR ENERGY CORP ONE ENERGY CENTER, PELLISSIPPI PKWY KNOXVILLE, TN 37922 ROBERT W HENDRICKS TITLE: STUDY OF XRAY RESIDUAL STRESS MEASUREMENTS IN NAVAL AVIATION MAINTENANCE ENVIRONMENTS TOPIC: 99	NAVY	\$ 42,819
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OFFICE: NASC

A RESEARCH AND DEVELOPMENT PROGRAM IS PROPOSED IN WHICH AN EXISTING PORTABLE X-RAY RESIDUAL STRESS ANALYSIS SYSTEM IS MODIFIED AND ADAPTED FOR FIELD USE IN A NAVAL AIRCRAFT MAINTENANCE ENVIRONMENT. IN PHASE I, IT IS PROPOSED: (1) TO ADAPT THE EXISTING INSTRUMENT TO

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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SPECIFIC AIRCRAFT COMPONENTS SUCH AS LANDING GEARS, BEARINGS, TAIL HOOKS, TURBINE BLADES AND NOZZLES, AND HELICOPTER TRANSMISSIONS; AND (2) DEVELOP THE NECESSARY PROCEDURES TO VERIFY THAT THE TECHNIQUE IS APPLICABLE TO THE VARIOUS ALLOYS FROM WHICH THESE COMPONENTS ARE MADE. UPON SUCCESSFUL COMPLETION OF PHASE I, THE PHASE II PROGRAM WILL CONSIST OF MODIFYING THE INSTRUMENT FOR FIELD USE IN THE SALT AIR CORROSIVE ATMOSPHERE OF NAVAL AIR REWORK FACILITIES, AND TO FIELD TEST THE INSTRUMENT IN THESE ENVIRONMENTS.

TECHNOLOGY SERVICE CORP 2950 31ST STREET SANTA MONICA, CA 90405 DR. D WHITE TITLE: TRACKING ALGORITHM-EXPLOITATION OF TOTAL INFERENCE BASE IN SURFACE SHIPS TOPIC: 41	NAVY	\$ 49,959
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OFFICE: NSSC

TO KEEP PACE WITH ADVANCED THREATS, FUTURE COMBAT SYSTEMS MUST TAKE FULL ADVANTAGE OF ALL INFORMATION AVAILABLE IN THE SHIPBOARD SENSORS. THIS STUDY ADDRESSES IMPROVEMENTS TO INTEGRATED AUTOMATIC DETECTION AND TRACKING (IADT) SYSTEMS IN TWO AREAS: INCREASING THE BASE OF SENSOR DATA AND EXTENDING THE MULTI-SENSOR CONTROL FUNCTION. CURRENT MULTI-SENSOR INTEGRATION ALGORITHMS WORK WELL IN CLEAR ENVIRONMENTS. HOWEVER, IN DEGRADED ENVIRONMENTS, THESE "STATISTICAL DISTANCE" ALGORITHMS BREAKDOWN PRIMARILY DUE TO LACK OF INFORMATION. TO EXTEND THE CAPABILITIES OF CURRENT ALGORITHMS, DATA WHICH ARE AVAILABLE BUT NOT TYPICALLY USED WILL BE EXAMINED TO DETERMINE APPLICABILITY IN EXPLOITING DIFFERENCES BETWEEN TARGET, ENVIRONMENT AND INTERFERENCE RETURNS. A GENERALIZED ASSOCIATION AND TRACKING ALGORITHM WILL BE DEVELOPED BASED ON THE STATISTICAL CHARACTERIZATION OF THE ADDITIONAL DATA. THE ALGORITHM AND ITS INPUTS WILL BE SIMULATED AND EVALUATED TO DETERMINE ITS EFFECTIVENESS IN VARIOUS ENVIRONMENTS. INCREASING USE OF COMPUTERS IN INDIVIDUAL SENSORS FOR ADAPTIVE MODE CONTROL PROVIDES ADDITIONAL DATA FOR USE IN MULTI-SENSOR INTEGRATION AND THE NEED FOR NEW MULTI-SENSOR CONTROL PROCEDURES. NEW LOCAL AND IADT CONTROL ARCHITECTURES WILL BE DEVELOPED FOR COMPUTER-CONTROLLED SENSORS. USE OF LOCAL TRACK DATA

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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AND CLUTTER/ENVIRONMENT MAP DATA IN THE MULTI-SENSOR INTEGRATION
PROCESS WILL BE INVESTIGATED.

TECHNOLOGY SERVICE CORPORATION 2950 31ST STREET SANTA MONICA, CA 90405 NICHOLAS WILLIS TITLE: AIR VEHICLE WARNING USING BISTATIC RADAR SONOBUOYS TOPIC: 109	NAVY	\$ 50,000
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A PRINCIPAL LESSON LEARNED FROM THE FALKLAND WAR WAS THAT, WITHOUT AIRBORNE RADARS, SHIPBOARD AIR DEFENSES HAD VERY LITTLE WARNING TIME TO REACT TO ATTACK FROM LOW ALTITUDE MISSILES AND AIRCRAFT. A NEW CONCEPT FOR PROVIDING SUCH WARNING USES A NET OF STANDARD NAVY SONOBUOYS, WHICH ARE CONFIGURED AS A BISTATIC RADAR FENCE. THE VHF DATA LINK TRANSMITTER ON EACH SONOBUOY ACTS AS A SEPARATE BISTATIC TRANSMITTER, AND A DATA LINK RECEIVER WITH A SPECIAL PURPOSE DOPPLER PROCESSOR ON THE ASW AIRCRAFT OR SHIP ACTS AS A SINGLE BISTATIC RECEIVER. TARGET AZIMUTH IS PROVIDED BY SIMPLY NOTING ON WHICH SONOBUOY FREQUENCY THE TARGET IS DETECTED. A 120 DEGREE SONOBUOY FENCE WILL CONTAIN 28 SONOBUOYS, SPACED 5 TO 10 NMI APART, LOCATED AS FAR AS 70 NMI FROM THE TASK GROUP. SIMULTANEOUS ASW OPERATIONS AND DETECTION OF VERY LOW CROSS-SECTION TARGETS ARE POSSIBLE WITH THIS CONFIGURATION. PHASE I OBJECTIVES ARE TO ESTABLISH OPTIMUM DEPLOYMENT CONFIGURATIONS AND PERFORMANCE; EVALUATE ECM, WAVE MASKING AND MULTIPATH EFFECTS; DESIGN THE BISTATIC PROCESSOR; AND PERFORM LABORATORY SPECTRAL PURITY MEASUREMENTS OF SONOBUOY TRANSMITTERS. FOLLOWING RESOLUTION OF THESE CRITICAL ISSUES, PHASE II WILL PERFORM DETAILED SYSTEM DESIGN AND TEST PLANNING, LEADING TO PROCESSOR DEVELOPMENT AND AT-SEA DEMONSTRATIONS.

TETRA CORP 1325 SAN MATEO SE P.O. BOX 4369 ALBUQUERQUE, NM 87196 WILLIAM M MOENY TITLE: SELF-SUSTAINED, RADIAL-DISCHARGE PULSED CO2 LASER DEVELOPMENT PROGRAM TOPIC: 22	NAVY	\$ 49,557
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NAVAL DEFENSE CAPABILITIES WILL BE GREATLY ENHANCED BY THE AVAILABILITY OF A MEDIUM-SCALE CO2 LASER ABOARD SHIP. IN THIS PROPOSAL WE PROPOSE TO DETERMINE THE FEASIBILITY OF USING MAGNETICALLY STABILIZED RADIAL GLOW DISCHARGES OPERATING IN A PULSED SELF-SUS-

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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TAINED MODE AT ATMOSPHERIC PRESSURE FOR PUMPING THE LASER PLASMA IN PULSED CO2 LASERS. BY USING A SELF-SUSTAINED GLOW DISCHARGE, WE ELIMINATE THE E-BEAM FOIL AND SUBSTANTIALLY IMPROVE THE RELIABILITY OF THE LASER SYSTEM. BY USING RADIAL DISCHARGE MAGNETIC STABILIZATION, WE EXPECT TO OBTAIN SUBSTANTIALLY HIGHER POWER LOADINGS COMPARED TO THOSE ACHIEVED IN SELF-SUSTAINED GLOW DISCHARGES AND ACHIEVE OUTPUT ENERGY DENSITY SIMILAR TO OR SUBSTANTIALLY BETTER THAN THAT DEMONSTRATED FOR E-BEAM-CONTROLLED DISCHARGES. THIS PROGRAM IS PRIMARILY FOCUSED ON EXPERIMENTALLY DETERMINING THE FEASIBILITY OF THE CONCEPT BY FABRICATING AND TESTING A RADIAL GLOW DISCHARGE DEVICE WITH MAGNETIC STABILIZATION. THIS EXPERIMENTAL PROGRAM INVOLVES THE MEASUREMENT OF ENERGY LOADED INTO THE LASER PLASMA AND LASER POWER EXTRACTED FROM ONE SECTOR OF THE DEVICE. THE ADVANCES IN TECHNOLOGY REPRESENTED BY THIS PROPOSAL WILL RESULT IN A NEW CLASS OF PULSED CO2 LASERS FOR NAVY DEFENSE APPLICATIONS. THIS PROPOSAL REPRESENTS A UNIQUE TECHNOLOGY ADVANCEMENT OPPORTUNITY FOR THE NAVAL SEA SYSTEMS COMMAND.

TETRA CORPORATION
1325 SAN MATEO SE
ALBUQUERQUE, NM 87108
WILLIAM M. MOENY

AF

\$ 49,111

TITLE:

UV-SUSTAINED RADIAL GLOW DISCHARGE OPENING SWITCH

TOPIC: 8b

OFFICE: AFWL/PRP

IN THIS PROPOSAL, WE PROPOSE TO DEVELOP A UV-SUSTAINED GLOW DISCHARGE OPENING SWITCH. THE GLOW DISCHARGE WOULD BE SUSTAINED BY A UV SOURCE AND THE DISCHARGE WOULD OPERATE IN A RADIAL GEOMETRY IN ORDER TO PROVIDE CERTAIN UNIQUE FEATURES TO THE OPENING SWITCH CHARACTERISTICS. THE UV PHOTONS FROM THE UV SUSTAINER PRODUCED FREE ELECTRONS THAT ARE ACCELERATED BY THE ELECTRIC FIELD. AS THE UV SOURCE IS TURNED OFF THE DISCHARGE WILL DECAY WITH THE LOSS OF ELECTRONS IN THE DISCHARGE. WE INTEND TO USE A RADIAL GLOW DISCHARGE AS A MEANS OF SUBSTANTIALLY ENHANCING THE CURRENT GAIN IN THE DEVICE AND ALSO AS A MEANS OF SUBSTANTIALLY IMPROVING THE SWITCH RATIO. THIS SWITCH HAS THE POTENTIAL FOR FULFILLING THE REQUIREMENT FOR A HIGH-REPETITION RATE OPENING SWITCH FOR PULSED POWER APPLICATIONS. WE BELIEVE THIS SWITCH HAS THE

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
CAPABILITY OF OPERATING IN A BURST MODE AT GREATER THAN 10 KHz AND IN A CONTINUOUS REPETITION MODE AT REPETITION RATES OF NEAR 1 KHz.		
THE ANALYTIC SCIENCES CORPORATION ONE JACOB WAY READING, MA 01867 MR. JOSEPH A. SIVAK TITLE: MISSILE GUIDANCE LAW TOPIC: 17b	AF	\$ 49,380
OFFICE: AD/AF		

TWO MISSILE GUIDANCE LAWS WILL BE DEVELOPED WHICH ALLOW SPECIFICATION OF FINAL MISSILE POSITION AND TIME-OF-ARRIVAL. EACH LAW WILL BE CODED, VERIFIED AND TRANSFERRED TO ARMAMENT DIVISION COMPUTER FACILITY FOR ON-SITE DEMONSTRATION. ONE GUIDANCE LAW WILL THE FINAL TIME AND MINIMIZES FINAL POSITION ERROR; THIS LAW WILL BE VERIFIED BY APPLICATION TO A JTACMS AIR-TO-SURFACE CONFIGURATION. THE SECOND GUIDANCE LAW WILL FIX THE FINAL POSITION AND MINIMIZES TIME-OF-ARRIVAL ERROR; THIS LAW WILL BE VERIFIED BY APPLICATION TO AN AXE SURFACE-TO-SURFACE CONFIGURATION. THE TWO GUIDANCE LAWS WILL BE DESIGNED FOR FLEXIBLE, RELIABLE OPERATION BY A NON-EXPERT. THESE LAWS WILL PROVIDE XRC PLANNERS WITH GUIDANCE MODULES THAT ARE COMPATIBLE WITH THEIR EXISTING SIMULATION CODES AND WILL PERMIT ANALYSIS OF THE RELATION BETWEEN OPERATIONAL SCENARIO REQUIREMENTS AND MISSILE SYSTEM CHARACTERISTICS (E.G., AERODYNAMICS, PROPULSION, PAYLOAD AND FIRE CONTROL).

THE ANALYTIC SCIENCES CORPORATION ONE JACOB WAY READING, MA 01867 JOHN C SEAQUIST TITLE: TACTICAL WEAPONS EFFECTIVENESS STUDY OF AN ANTI-SHIP MISSILE SYSTEMS USING AUTOMATIC TARGET RECOGNITION TOPIC: 131	NAVY	\$ 48,351
OFFICE: JCMPO		

THIS PROPOSAL IS TO DEVELOP AND EXERCISE A METHODOLOGY TO EVALUATE ALTERNATIVE TARGET RECOGNITION CAPABILITIES FOR ANTI-SHIP CRUISE MISSILES. THE EFFECTIVENESS OF THIS WEAPON SYSTEM IS LIMITED BY MULTIPLE, LARGE ERROR CONTRIBUTIONS WHICH RESULT IN A NEED FOR

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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THE MISSILE TO SEARCH A LARGE OCEAN AREA FOR THE INTENDED TARGET. THIS AREA IS LIKELY TO CONTAIN SEVERAL BACKGROUND SHIPS IN ADDITION TO THE INTENDED TARGET, AND THEREFORE A TARGET RECOGNITION CAPABILITY IS NEEDED TO PERMIT THE MISSILE TO DISCRIMINATE THE INTENDED TARGET FROM BACKGROUND SHIPPING. THE PROPOSED METHODOLOGY CONSISTS OF FOUR MODULES. THE TARGET SEARCH AREA MODULE COMBINES TARGETING ERROR SOURCES AND BACKGROUND SHIPPING DENSITY STATISTICS TO COMPUTE THE REQUIRED SEARCH AREA AND NUMBER OF BACKGROUND SHIPS (MODELED STATISTICALLY) WITHIN THAT AREA. THE TARGET RECOGNITION MODULE MODELS ALTERNATIVE TARGET DETECTION/CLASSIFICATION CONCEPTS AND THE INFORMATION GENERATED IN EACH TARGET ENGAGEMENT. THE TARGET ACQUISITION MODULE EVALUATES THE OUTCOMES OF A SEARCH SEQUENCE VIA A PROBABILISTIC DECISION TREE. THE FORCE EFFECTIVENESS MODULE AGGREGATES RESULTS ON A FORCE BASIS. REPRESENTATIVE ANALYSES WILL BE CONDUCTED TO DETERMINE THE FEASIBILITY AND BENEFITS OF THE METHODOLOGY.

THERMACORE, INC.	AF	\$ 53,063
780 EDEN ROAD		
LANCASTER, PA 17601		
DONALD M. ERNST		
TITLE:		
HIGH PERFORMANCE ALUMINUM HEAT PIPE DEVELOPMENT		
TOPIC: 10b	OFFICE: AFWAL/XRPF	

THERMACORE HAS DEVELOPED, IN OTHER MATERIALS, TECHNOLOGY FOR PRODUCING SUBSTANTIAL INCREASES IN CAPILLARY PUMPING PRESSURES IN HEAT PIPES. THE IMPROVEMENTS STEM FROM THE USE OF SMALL PORE STRUCTURES FABRICATED FROM SINTERED POWDERS. THE OBJECTIVE OF THE PROPOSED PHASE I PROGRAM IS TO DEVELOP AND DEMONSTRATE THE TECHNIQUES FOR PRODUCING THESE STRUCTURES IN ALUMINUM. SUCCESS IN THIS PROGRAM WILL BRING ABOUT A TWENTY-FIVE FOLD INCREASE IN THE CAPILLARY PUMPING CAPABILITY OF ALUMINUM/AMMONIA HEAT PIPES. THIS IN TURN WILL RESULT IN AN EQUIVALENT INCREASE IN THE HEAT TRANSFER CAPACITY OF HEAT PIPES FOR SPACE-CRAFT THERMAL CONTROL. THE PROPOSED HEAT PIPES WILL PERFORM WELL WITH DISTRIBUTED EVAPORATORS.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
THERMACORE, INC. 780 EDEN ROAD LANCASTER, PA 17601 G. YALE EASTMAN TITLE: POWER FLATTENING TECHNIQUES FOR RTG'S TOPIC: 1b OFFICE: DARPA	DARPA	\$ 54,232

PRESENT ISOTOPIC HEAT SOURCES FOR RADIOISOTOPE THERMOELECTRIC GENERATORS HAVE POTENTIALLY SERIOUS PROBLEMS WITH TOXICITY AND ACCOUNTABILITY. IT IS DESIRED TO IDENTIFY ALTERNATIVE ISOTOPIC FUELS THAT DO NOT HAVE THESE PROBLEMS. THE PROPOSED PROGRAM INVOLVES THE DEVELOPMENT OF A TECHNIQUE FOR PROVIDING CONSTANT INPUT POWER AND TEMPERATURE TO THERMOELECTRIC CONVERTERS THROUGH SEVERAL ISOTOPE HALF LIVES. THIS WILL PERMIT THE USE OF NON-WEAPONS GRADE ISOTOPES WITH TOXICITIES AS MUCH AS 10,000 TIMES LESS THAN pU238.

TRIANGLE RESEARCH AND DEVELOPMENT CORP P.O. BOX 12696 RESEARCH TRIANPK, NC 27709 DAVID P. COLVIN TITLE: MEDICAL SUPPORT-SUCTION AND INFUSION DEVICES TOPIC: 6x OFFICE: SGRD-MRDC	ARMY	\$ 47,073
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IT IS PROPOSED TO INVESTIGATE THE DEVELOPMENT AND FABRICATE BOTH A PROTOTYPE SUCTION SERVICE AND A PROTOTYPE INFUSION DEVICE THAT WILL UTILIZE A MECHANICAL ROLLER PUMP POWERED WITH ALTERNATIVE MECHANISMS. THE LIGHTWEIGHT AND PORTABLE SUCTION DEVICE WILL BE EXPECTED TO PROVIDE CONTROLLED SUCTION OVER A WIDE RANGE OF VACUUM (10 TO 100 CM WATER) FOR VARIOUS TUBE AND OPERATIVE SITE USAGE. POWER FOR THE DEVICE WILL BE NON-ELECTRICAL AND MAY BE PRODUCED BY A SPRING-WOUND MECHANISM WITH A CONSTANT FORCE OUTPUT AND AN INTEGRAL SPEED CONTROL. THE IN-TRAVENOUS INFUSION DEVICE WILL BE GRAVITY-INDEPENDENT AND EXPECTED TO DELIVER MEASURED AMOUNTS OF FLUIDS AT A PRESSURE OF 50 TO 100 CM WATER AND A RELIALE RATE OF 125 ML/HR WITHOUT TECHNICAL SUPERVISION FOR USE DURING MASS CASUALTY AND TRANSPORT OF WOUNDED. BOTH A SPRING-

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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WOUND MECHANISM AS DESCRIBED ABOVE AND A DO-POWERED SERVO STEPPING MOTOR WITH DIGITAL SPEED CONTROL WILL BE INVESTIGATED TOGETHER WITH OTHER POTENTIAL CANDIDATES FOR DRIVING THE ROTARY PERISTALTIC INFUSION PUMP. A PRESSURE SENSOR ALARM WILL DISCONTINUE THE FLOW IF SYSTEM PRESSURE RISES ABOVE 150 CM OF WATER TO AVOID DANGEROUS INTERCELLULAR INFILTRATION IF THE INFUSING NEEDLE LEAVES THE VEIN.

TRIANGLE RESEARCH AND DEVELOPMENT CORP P.O. 12696 RES TRIANGLE PARK, NC 27709 DAVID P COLVIN TITLE: PROTOTYPE HELICOPTER LANDING ZONE LIGHTING SYSTEM TOPIC: 130	NAVY	\$ 53,319
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IT IS PROPOSED TO DEVELOP A PROTOTYPE HELICOPTER LANDING ZONE LIGHTING SYSTEM FOR USE ON NIGHT HELICOPTER ASSAULTS WHEN PILOTS ARE WEARING NIGHT VISION GOGGLES (NVGS). THE SYSTEM WILL BE SMALL, LIGHTWEIGHT AND CAPABLE OF BOTH DIRECTIONAL ILLUMINATION AND REMOTE ACTIVATION BY A CODED RADIO BEACON. AS PROPOSED THE BATTERY-POWERED SYSTEM WILL UTILIZE MULTIPLE ELECTROLUMINESCENT LAMPS, A SOLID-STATE INVERTER, AND A RADIO TRANSMITTER AND RECEIVER CAPABLE OF CODED TRANSMISSION AND ACTIVATION OF THE SYSTEM. IF DESIRED, THE LAMP INTENSITY OF THE SYSTEM MAY ALSO BE REMOTELY ADJUSTED. THE SYSTEM WILL BE DESIGNED TO PREVENT NVG "WHITEOUT" OR IMPAIR NORMAL NIGHT VISION.

U.S. COMPOSITES 5 SCIENCE PARK NEW HAVEN, CT 06511 AUGUST HUGO KRUESI TITLE: RESIN APPLICATOR RING FOR MANUFACTURE OF LIGHTWEIGHT HIGH PERFORMANCE BRAIDED COMPOSITE PARTS TOPIC: 7q	ARMY	\$ 23,550
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BRAIDING MACHINERY CAN BE ADAPTED TO PRODUCE LOW COST, HIGH PERFORMANCE COMPOSITE PARTS. FIBER IMPREGNATION HAS BEEN A LIMITING FACTOR IN THE USEFULNESS OF BRAIDING. PREIMPREGNATED FIBERS ARE EXPENSIVE AND BRAID POORLY BECAUSE OF THE RESIN TACK. THE PROPOSED RESIN

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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APPLICATOR RING WILL PROVIDE CONTINUOUS IMPREGNATION WITH LOW COST LIQUID RESINS DURING BRAIDING WITH NO REDUCTION OF BRAIDING SPEED AND NO LIMITATIONS IN PART GEOMETRY. COST SAVINGS ARE EXPECTED TO BE 12-32 PERCENT COMPARED TO PARTS MADE WITH PREIMPREGNATED YARNS. ADDITIONAL BENEFITS MAY INCLUDE GREATER VERSATILITY LOWER TOOLING COSTS, SIMPLER CURE CYCLES, AND SHORTER LEAD TIMES. THE PURPOSES OF THIS PHASE I PROPOSAL ARE TO OBTAIN EXPERIMENTAL VERIFICATION OF THE APPLICATOR RING CONCEPT. TO DEVELOP A SIMPLE COMPUTER PROGRAM TO FACILITATE PRODUCTION USING THE APPLICATOR RING, AND TO COMPILE NEEDED DATA ON AVAILABLE RESINS AND FIBERS.

ULTRAMET
12173 MONTAGUE STREET
PACOIMA, CA 91331
RICHARD B. KAPLAN

AF \$ 49,427

TITLE:
OXIDATION RESISTANT PLATINUM GROUP COATINGS
TOPIC: 3 OFFICE: AFRPL/TSPP

IN ORDER TO ACHIEVE INCREASED EFFICIENCY, LIFE, AND PERFORMANCE, ROCKET ENGINES REQUIRE OPERATION AT HIGHER AND HIGHER TEMPERATURES. IN ORDER TO OBTAIN SUFFICIENT STRENGTH AT THESE TEMPERATURES, THE REFRACTORY METALS SUCH AS MOLYBDENUM, TUNGSTEN, TANTALUM, NIOBIUM AND RHENIUM MUST BE USED TO FABRICATE THE PARTS WHICH WILL BE EXPOSED TO THESE TEMPERATURES. THESE METALS AND THEIR STRUCTURALLY IMPORTANT ALLOYS HAVE NOTORIOUSLY POOR RESISTANCE TO OXIDATION IN THE TEMPERATURE RANGE WHERE THEIR STRENGTH CHARACTERISTICS ARE VITALLY NEEDED. PROTECTION, IN THE FORM OF COATINGS, FROM THE OXIDIZING ENVIRONMENT IS CRUCIAL FOR SUCCESSFUL OPERATION. CURRENT COATING TECHNOLOGY IS NOT SUFFICIENT TO ACHIEVE SATISFACTORY OPERATION. NEW OXIDATION RESISTANT COATING MATERIALS AND PROCESSES MUST BE DEVELOPED WHICH WILL PERMIT OPERATION IN THE 500 DEGREE C TO 2000 DEGREE C TEMPERATURE RANGE. THE PLATINUM GROUP METALS OFFER A HIGH PROBABILITY OF SUCCESS AS OXIDATION RESISTANT COATING MATERIALS. ULTRAMET PROPOSES TO DEVELOP THE TECHNOLOGY REQUIRED TO CHEMICALLY VAPOR DEPOSIT DENSE, ADHERENT COATINGS OF IRIIDIUM AND TO DETERMINE ITS OXIDATION PROTECTIVE TEMPERATURE RANGE. PHASE II WILL EXPAND THE EFFORT TO CVD THE OTHER PLATINUM GROUP METALS.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
ULTRAMET 12173 MONTAGUE STREET PACOIMA, CA 91331 RICHARD KAPLAN TITLE: HIGH TEMPERATURE OXIDATION RESISTANT COATINGS TOPIC: 3 OFFICE: AFRPL/TSPR	AF	\$ 48,821

IN ORDER TO ACHIEVE INCREASED EFFICIENCY, LIFE, AND PERFORMANCE, ROCKET ENGINES REQUIRE OPERATION AT HIGHER AND HIGHER TEMPERATURES. IN ORDER TO OBTAIN SUFFICIENT STRENGTH AT THESE TEMPERATURES, THE REFRAC-TORY METALS SUCH AS MOLYBDENUM, TUNGSTEN, TANTALUM, NIOBIUM, AND RHENIUM MUST BE USED TO FABRICATE THE PARTS WHICH WILL BE EXPOSED TO THESE TEMPERATURES. THESE METALS AND THEIR STRUCTURALLY IMPORTANT ALLOYS HAVE NOTORIOUSLY POOR RESISTENCE TO OXIDATION IN THE TEMPER-ATURE RANGE WHERE THEIR STRENGTH CHARACTERISTICS ARE VITALLY NEEDED. PROTECTION, IN THE FORM OF COATINGS, FROM THE OXIDIZING ENVIRONMENT IS CRUCIAL FOR SUCCESSFUL OPERATION. CURRENT COATING TECHNOLOGY IS NOT SUFFICIENT TO ACHIEVE SATISFACTORY OPERATION. NEW OXIDATION RESISTANT COATING MATERIALS AND PROCESSES MUST BE DEVELOPED WHICH WILL PERMIT OPERATION IN THE 500C TO 2000C TEMPERATURE RANGE. HAFNIUM OXIDE AND ZIRCONIUM OXIDE OFFER TWO POTENTIAL CANDIDATES FOR OXIDATION RESISTANT COATING MATERIALS. ULTRAMET PROPOSES TO DEVELOP THE TECHNOLOGY REQUIRED TO CHEMICALLY VAPOR DEPOSIT DENSE, ADHERENT COATINGS OF HAFNIUM OXIDE AND ZIRCONIUM OXIDE AND TO DETERMINE THEIR OXIDATION PROTECTIVE TEMPERATURE RANGE. ULTRAMET HAS HAD EXPERIENCE CHEMICALLY VAPOR DEPOSITING BOTH MATERIALS AND INITIAL TESTS ON HAFNIUM OXIDE ARE VERY ENCOURAGING.

ULTRASYSTEMS, INC. 2400 MICHELSON DRIVE IRVINE, CA 92715 K.L. PACIOREK TITLE: WEAR, OXIDATION, AND CORROSION INHIBITORS FOR CTFE FLUIDS TOPIC: 11g OFFICE: AFWAL/XRPM	AF	\$ 49,925
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THE OBJECTIVE OF THE PROPOSED PROGRAM IS TO PREPARE AND EVALUATE A SERIES OF OXIDATION, CORROSION, AND WEAR-INHIBITING ADDITIVES FOR CTFE FLUIDS EFFECTIVE AT >275F. THE CANDIDATE ADDITIVES ARE MONO- AND DIPHOSPHA-S-TRIAZINES SUBSTITUTED ON THE PHOSPHORUS ATOMS BY PHENYL

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>AND/OR THIO-GROUPS AND BY PERFLUOROALKYL OR PERFLUOROALKYLETHETHER GROUPS ON THE CARBON RING ATOMS. THE MATERIALS CONTAINING PHENYL-SUBSTITUTED PHOSPHORUS RING ATOMS WERE SHOWN TO BE EFFECTIVE ANTI-CORROSION AND ANTI-OXIDATION AGENTS IN PERFLUOROALKYLETHETHER FLUIDS; THE PRESENCE OF PERFLUOROALKYL OR PERFLUOROALKYLETHETHER CHAINS IS BELIEVED TO ASSURE SOLUBILITY IN CTFE. ADDITIVE-CTFE FLUID FORMULATIONS WILL BE EVALUATED USING SELECTED METALS AND ALLOYS IN A MICRO-OXIDATION-CORROSION TEST ASSEMBLY, AS WELL AS "DIP-COATED" METAL SPECIMENS EXPOSED TO A 100% HUMIDITY ENVIRONMENT AT 158F. SELECTED FORMULATIONS WILL FURTHERMORE BE SUBJECTED TO 4-BALL WEAR TESTS TO EVALUATE THE LUBRICITY AND FILM FORMING CHARACTERISTICS OF THE DEVELOPED ADDITIVES. BASED ON THE TEST RESULTS, OPTIMUM ADDITIVES WILL BE DEVELOPED.</p>		

UNDERWATER SYSTEMS, INC.
1776 EAST JEFFERSON STREET
ROCKVILLE, MD 20852
ERIC L. SANDER

NAVY \$ 62,000

TITLE:
ALGORITHMIC DESIGN OF A SYSTEM FOR ACOUSTIC DETECTION, LOCAL-
IZATION AND CLASSIFICATION OF A REMOTE DETONATION AT SEA
TOPIC: 117 OFFICE: NR

THE PURPOSE OF THE PROPOSED PROJECT IS TO PROVIDE AN ALGORITHMIC DESIGN OF A SYSTEM FOR THE DETECTION, LOCALIZATION AND CLASSIFICATION (ALTITUDE/DEPTH AND YIELD) OF A REMOTE DETONATION AT SEA USING HYDROACOUSTIC DATA. THIS INFORMATION CAN BE OBTAINED FROM THE SIGNAL POWER SPECTRUM LEVELS, SIGNAL ARRIVAL TIMES AND REVERBERATION TIME HISTORIES OBSERVED BY THE MONITORING HYDROPHONES AND ESTIMATES OF THE ACOUSTIC PROPAGATION CONDITIONS BETWEEN THE DETONATION AND THE HYDROPHONES. SUCH INFORMATION WOULD PROVIDE CLUES AS TO WHETHER THE DETONATION WAS NUCLEAR OR NON-NUCLEAR, PURPOSE AND SOPHISTICATION OF THE DETONATING DEVICE AND ALSO THE IDENTITY OF THE TESTING NATION. THIS ALGORITHMIC DESIGN WILL INVOLVE THE DEVELOPMENT OF SOME NEW ALGORITHMS FROM EXISTING THEORY, THE ADAPTATION OF EXISTING ALGORITHMS AND THE INTEGRATION OF THESE ALGORITHMIC COMPONENTS INTO A SINGLE, COHERENT UNIT. IT WILL ALSO INVOLVE THE ESTIMATION OF THE POTENTIAL ACCURACY OF AN IMPLEMENTED SYSTEM. THIS WOULD PROVIDE A BASIS FOR DETERMINING THE UTILITY OF THE SOFTWARE, HARDWARE AND STAFFING IMPLEMENTATION OF

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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THE SYSTEM IN SUBSEQUENT PROGRAM PHASES.

UNIQUE MOBILITY, INC. 3700 SOUTH JASON ENGLEWOOD, CO 80110 JOHN S. GOULD TITLE: ELECTRIC ROBOTIC MEDICAL SUPPORT VEHICLE TOPIC: 5L OFFICE: MRDC	ARMY	\$ 45,022
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ELECTRIC MOTORS GENERALLY AVAILABLE FOR ELECTRIC VEHICLES ARE INEFFICIENT AT LOW SPEEDS AND DISPROPORTIONATELY HEAVY. UNIQUE HAS AN INNOVATIVE CONCEPT FOR A PERMANENT MAGNET HOLLOW CYLINDER ELECTROMAGNETIC TRANSDUCER THAT CAN FUNCTION AS A COMPACT, LIGHTWEIGHT AND EFFICIENT DIRECT DRIVE WHEEL MOUNTED TRACTION MOTOR AT LESS THAN ONE HALF THE SIZE AND WEIGHT OF CONVENTIONAL EV TRACTION MOTORS. THIS MOTOR COMBINED WITH A REVOLUTIONARY NEW COMPUTER CONTROLLED VERTICAL STRUT SUSPENSION HAS THE CAPABILITY TO PROPEL A TACTICAL ROBOTIC VEHICLE OVER BATTLEFIELD AMBIENT TERRAIN QUICKLY, QUIETLY AND SMOOTHLY

THE RESEARCH WILL DETERMINE OPTIMUM DESIGN PARAMETERS, POTENTIAL VEHICLE APPLICATIONS AND COST EFFECTIVENESS OF THE SYSTEM. THE WORK PLAN ENTAILS THE EVALUATION OF A WORKING MODEL AND CONCLUDES WITH A COMPUTER ANALYSIS OF PERFORMANCE DATA. THE EVALUATION WILL REFERENCE ALL IMPUTED DATA TO SIMILAR DATA PREVIOUSLY COMPILED ON UNIQUE'S CONVENTIONALLY POWERED ELECTREK EV.

UNIVERSAL ENERGY SYSTEMS, INC. 4401 DAYTON-XENIA ROAD DAYTON, OH 45432 GARY STREBY TITLE: HIGHLY CONDUCTING INTERCALATED CARBON COMPOSITES - FIBER PASSIVATION AND BINDER STUDIES. TOPIC: 13d OFFICE: AFWAL/XRP-PO	AF	\$ 49,168
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USING A UNIQUE APPROACH, INTERCALATED CARBON FIBER BUNDLES WILL BE PROCESSED TO FORM COMPOSITES. SUBSEQUENTLY, EACH FIBER BUNDLE WILL BE TESTED FOR ELECTRICAL AND OTHER PHYSICAL PROPERTIES. THE BEST PROCESSING METHOD FOR ACHIEVING THE DESIRED MATERIAL CHARACTERISTICS

FISCAL YEAR 1983

SUBMITTED BY	DEPT	AWARDED AMOUNT
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WILL THUS BE DETERMINED. SUCCESSFUL COMPLETION OF THIS PROGRAM WILL PROVIDE A METHOD(S) OF PRODUCING INTERCALATED CARBON COMPOSITES THAT ARE HIGHLY CONDUCTING, LIGHTWEIGHT, HIGH STRENGTH, AND HAVE A LOW THERMAL EXPANSION COEFFICIENT. AS SUCH, THESE COMPOSITES WOULD BE SUPERIOR TO COPPER IN MANY AEROSPACE APPLICATIONS.

UNIVERSAL ENERGY SYSTEMS, INC.
4401 DAYTON-XENIA ROAD
DAYTON, OH 45432
V. SRINIVASAN

AF

\$ 50,477

TITLE:

LIFE PREDICTION OF TURBINE BLADE NICKEL BASE SUPERALLOY SINGLE CRYSTALS

TOPIC: 11f

OFFICE: AFWAL/XRPM

THE PROPOSED RESEARCH ADDRESSES IN AN EXPLORATORY WAY THE PROBLEM OF HIGH TEMPERATURE LOW CYCLE FATIGUE (HTLCF) IN SINGLE CRYSTAL NICKEL BASE ALLOY, RENE N4. THIS ALLOY BELONGS TO THE LATEST CLASS OF ALLOYS IDENTIFIED FOR APPLICATION IN FUTURE MILITARY AIRCRAFTS. THE SCOPE OF THIS PROPOSAL INCLUDES STUDIES ON SAMPLES WITH HIGH TEMPERATURE PROTECTIVE ALUMINIDE COATING. FATIGUE TESTS WILL BE CONDUCTED IN LAB AIR ON CYLINDRICAL SAMPLES WITH (001) ORIENTATION, OR THE ONE CLOSER TO IT PARALLEL TO THE STRESS AXIS. ONE TEMPERATURE, ONE FREQUENCY, AND THREE STRAIN RANGES WILL BE USED. MICRO-STRUCTURE AND DAMAGE ACCUMULATION WILL BE STUDIED EXTENSIVELY THROUGH OPTICAL, SCANNING AND TRANSMISSION ELECTRON MICROSCOPY TECHNIQUES. PROCEDURE FOR THIN-FOIL PREPARATION FOR TEM STUDY WILL BE STANDARDIZED. TEST RESULTS WILL BE DISCUSSED IN TERMS OF COFFIN-MANSON AND OTHER LIFE PREDICTION PROCEDURES. STRUCTURE-PROPERTY CORRELATION WILL BE ESTABLISHED TO UNDERSTAND MICRO-MECHANISM OF DAMAGE AND THE ROLE OF COATING THEREIN.

UNIVERSAL ENERGY SYSTEMS, INC.
4401 DAYTON-XENIA ROAD
DAYTON, OH 45432
M. KHOBAIB

AF

\$ 50,793

TITLE:

CORROSION BEHAVIOR OF LOW DENSITY ALUMINUM LITHIUM-X AND ELEVATED TEMPERATURE ALUMINUM-IRON-X ALLOYS

TOPIC: 11d

OFFICE: AFWAL/XRPM

THE EVER INCREASING DEMAND TO INCORPORATE LIGHTER WEIGHT, LOWER COST ALLOYS FOR AEROSPACE APPLICATIONS HAS LED TO THE DEVELOPMENT OF A SERIES OF ALUMINUM-LITHIUM-X (AL-LI-X) AND ALUMINUM-IRON-X (AL-FE-X) ALLOYS. AL-LI-X ALLOYS PROVIDE SIGNICANT WEIGHT AND LIFE-CYCLE COST

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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REDUCTIONS IN AIRCRAFT STRUCTURES BY VIRTUE OF THEIR HIGH STRENGTH IN CONJUNCTION WITH LOW DENSITY AND HIGHER MODULUS AS COMPARED WITH PRESENT COMMERCIAL HIGH STRENGTH 2XXX AND 7XXX SERIES ALUMINUM ALLOYS OR OTHER ALTERNATIVES SUCH AS TITANIUM ALLOYS OR ADVANCED COMPOSITES. AL-FE-X IS ANOTHER CLASS OF CURRENT ALLOY SYSTEM INTENDED FOR ELEVATED TEMPERATURE APPLICATIONS, AND SHOWS GREAT POTENTIAL TO ECONOMICALLY REPLACE TITANIUM ALLOYS. THESE ALLOYS HAVE SHOWN PROMISE TO OPERATE AT OR NEAR CAPACITY WITH RESPECT TO STRESS AND TEMPERATURE, BUT HAVE YET TO BE TESTED FOR THEIR CORROSIVE RESISTANCE BEHAVIOR. DETAILED INFORMATION ON THE CORROSION BEHAVIOR SUCH AS CREVICE CORROSION, GALVANIC CORROSION, EXFOLIATION, OF THESE ALLOYS IS LACKING. THEREFORE, IT IS PROPOSED TO CONDUCT AN INVESTIGATION ON AT LEAST SOME OF THE MOST PERTINENT CORROSION PROBLEMS EXPECTED IN APPLICATION.

UNIVERSAL TECHNOLOGY, INC.
SUITE 1030, UAL BUILDING
SEATTLE, WA 98121
DR. J. ANDERSEN
TITLE:
PATTERN RECOGNITION
TOPIC: 9f OFFICE: RADC/DORP

AF \$ 48,139

THERE IS A NEED FOR HIGH SPEED EXTRACTION OF USEFUL INFORMATION FROM VARIOUS SENSORS IN TACTICAL SITUATIONS. CURRENT APPROACHES ARE SLOW, INACCURATE AND REQUIRE EXCESSIVE MEMORY FILES. THE PROPOSED PROJECT DEFINES AN INNOVATIVE SYSTEM WHICH PROVIDES IMPROVEMENTS OVER EXISTING TECHNIQUES THROUGH USE OF CONTINUAL OUTPUT, VARIABLE MESSAGE LENGTH, ADAPTIVE MATCH CRITERIA TECHNIQUES. THE STUDY WILL PROVIDE REQUIREMENTS DEFINITION, PRELIMINARY SYSTEM DESIGN AND A SYSTEMS APPLICATION STUDY FOR A SYSTEM WHICH USES A PATENTED CORRELATOR. MILITARY APPLICATIONS INCLUDE COMMUNICATIONS, ELECTRONIC WARFARE, OPTICAL DEVICES, PROGRAMMING APPLICATIONS, RADAR AND SONAR.

VERAC, INCORPORATED
10975 TORREVANA ROAD, SUITE 300
SAN DIEGO, CA 92121
ROBERT BOCKSTAHLER
TITLE:
ADVANCED WORKSTATION FOR OCEAN SURVEILLANCE
TOPIC: 87 OFFICE: NESC

NAVY \$ 49,923

WORK STATIONS ARE NEEDED FOR LAND AND SEA BASED OCEAN SURVEILLANCE SYSTEMS FOR REDUCTION OF INTELLIGENCE AND OPERATIONAL DATA. THIS PROJECT IS DIRECTED AT THE DEVELOPMENT OF VERY POWERFUL WORK STATIONS. THESE WILL SUPPORT MAN-MACHINE SYSTEMS WITH CAPABILITIES OF EXPLOI-

FISCAL YEAR 1983

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TATION OF DATA BECOMING AVAILABLE FROM EMERGING SENSOR SYSTEMS TO PROVIDE THE MOST COMPLETE OCEAN SURVEILLANCE PRODUCT POSSIBLE. PHASE I IS DIRECTED AT DEMONSTRATING THE FEASIBILITY AND POTENTIAL BENEFIT OF MARRYING A POWERFUL SYMBOLIC PROCESSOR WITH CO-PROCESSORS TO PROVIDE THE ADVANCED WORK STATION CAPABILITY. SUBSEQUENT PHASES WOULD CREATE A PROTOTYPE WITH SPECIAL PURPOSE HARDWARE LEADING ULTIMATELY TO A VHSIC IMPLEMENTATION.

VERDIX CORPORATION 7655 OLD SPRINGHOUSE ROAD MCLEAN, VA 22102 GEORGE COWAN TITLE: NETWORK SECURITY DEVICE DEVELOPMENT TOPIC: 15b	AF	\$ 57,212
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THIS EFFORT ADDRESSES THE REQUIREMENTS AND DESIGN ISSUES SURROUNDING THE DEVELOPMENT OF SECURE COMPUTER NETWORKS. WE PROPOSE A DESIGN FOR A SECURE COMPUTER NETWORK WHICH INCORPORATES NETWORK SECURITY DEVICES. THIS NETWORK IS EXPECTED TO PROVIDE A PROCESSING ENVIRONMENT WITH ACCEPTABLE PERFORMANCE WHERE SHARING OF CLASSIFIED INFORMATION MAY BE ACCOMPLISHED WITH CONFIDENCE IN THE PRESERVATION OF THE SECURITY AND INTEGRITY OF THE INFORMATION BEING MANIPULATED. THE PHASE I WORK SHALL DETERMINE THE FEASIBILITY OF USING A FAMILY OF NETWORK SECURITY DEVICES IN ORDER TO ATTAIN COMPUTER NETWORK SECURITY. IN DOING SO, IT SHALL PROVIDE A FORMAL TOP-LEVEL SPECIFICATION OF A SECURE NETWORK AND OF THE FUNCTIONALITY OF THE NETWORK SECURITY DEVICE USED TO ATTAIN THAT SECURITY.

VERSAR INC. 6850 VERSAR CENTER SPRINGFIELD, VA 22151 JAMES D. MIESSLER TITLE: ACOUSTIC AND MECHANICAL PROPERTIES OF CANDIDATE ACOUSTIC LENS MATERIALS TOPIC: 15	NAVY	\$ 72,820
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A PROGRAM IS PROPOSED TO INVESTIGATE ACOUSTIC AND MECHANICAL PROPERTIES OF A CLASS OF MATERIALS FOR USE AS ACOUSTIC LENS DEVICES. THE MATERIALS, SYNTACTIC FOAMS, CAN BE COMPOSITIONALLY VARIED OVER WIDE RANGES TO AFFECT THE ACOUSTIC IMPEDENCE, SOUND VELOCITY, AND

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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ATTENUATION. FUTHERMORE, THIS CLASS OF MATERIALS IS RELATIVELY INSENSITIVE TO ENVIRONMENTAL CHANGES, THUS KEEPING LENS ABERRATION TO A MINIMUM. THE GOAL OF THE PHASE I PROPOSAL IS TO GENERATE SUFFICIENT DATA TO PERMIT LATER FABRICATION OF A GRADED DENSITY LENS STRUCTURE BY CENTRIFUGAL CASTING.

VERSAR, INC. POST OFFICE BOX 1549 6850 VERSAR CENTER SPRINGFIELD, VA 22151 DR. ROBERT G. SHAVER TITLE: SMALL CARBON PARTICLES MODIFIED BY SURFACE TREATMENT WITH ION/ COBALT ALLOYS AS PIGMENT IN COATINGS TO REDUCE RADAR CROSS SECTION TOPIC: 100 OFFICE: NASC	NAVY	\$ 60,766
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SMALL PARTICLE COATING TECHNOLOGY RECENTLY DEVELOPED AT VERSAR, INC. MAKES IT POSSIBLE TO APPLY COBALT/IRON ALLOYS TO THE SURFACE OF SMALL CARBON PARTICLES IN AMOUNTS APPROXIMATELY THE SIZE OF INDIVIDUAL MAGNETIC DOMAINS. A 50/50 COBALT/IRON ALLOY IS A HIGH PERMEABILITY ALLOY THAT ALSO HAS HIGH HYSTERESIS LOSS AND AND HIGH CURIE POINT. WE BELIEVE A COMPOSITE PIGMENT PARTICLE CONSISTING OF CARBON SUBSTRATE OF 1 TO 10 MICRONS SIZE HAVING DISCRETE REGIONS OF COBALT/IRON ALLOY UPON THE SURFACE WOULD BE AN OUTSTANDING BROAD BAND RADIATION ABSORBER WHEN DISPERSED IN A DIELECTRIC BINDER MEDIUM. IT COULD BE EXPECTED TO BE EFFECTIVE OVER A WIDE RANGE OF RADAR FREQUENCIES AND ALSO BE ABSORPTIVE AT THE MUCH HIGHER VISIBLE LIGHT AND INFRARED FREQUENCIES. WE PROPOSE TO DEMONSTRATE SUCH PIGMENT PARTICLES IN A 6-MONTH PROGRAM BY 1) PRODUCING A SUPPLY OF NARROW PARTICLE SIZE RANGE (1 TO 10 MICRONS) SOLID CARBON PARTICLES, 2) DEVELOP SUFFICIENT COATING PARAMETER DATA TO BE ABLE TO PRODUCE 50/50 COBALT/IRON UPON THEM, 3) PRODUCE A SUPPLY OF PIGMENT PARTICLES IN THREE ALLOY RATIOS INCLUDING 50/50, 4) FABRICATE TEST COATED PLATES WITH EPOXY RESIN BINDER, AND 5) TEST FOR RADAR REFLECTANCE, COMPLEX PERMITTIVITY AND PERMEABILITY FROM 450 mhz TO 40 ghz AND MEASURE VISIBLE LIGHT REFLECTANCE.

VISIDYNE, INC. 5 CORPORATE PLACE, S. BEDFORD STREET BURLINGTON, MA 01803 THEODORE F. ZEHNPFENNIQ TITLE: REAL-TIME ADAPTIVE NUCLEAR CLUTTER MITIGATION TOPIC: 2 OFFICE: DDST	DNA	\$ 70,721
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ADVANCED SURVEILLANCE SYSTEMS WILL BE REQUIRED TO OPERATE IN A TRANS-ATTACK AND POST-ATTACK ENVIRONMENT. THE HIGH ALTITUDE CLUTTER FOR SUCH AN ENVIRONMENT IS NOT ACCURATELY CHARACTERIZED. THE PROPOSED OPTICAL TECHNIQUE PROVIDES A REAL TIME ADAPTIVE CAPABILITY TO REJECT

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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NUCLEAR CLUTTER AND OPTIMIZE SYSTEM PERFORMANCE. THIS TECHNIQUE UTILIZES A DUAL-STATE OPTICAL SYSTEM WHOSE IMAGING PROPERTIES ALTERNATE BETWEEN TWO MODES WITH TIME AND A DETECTOR WHOSE OUTPUT IS PROPORTIONAL TO THE DIFFERENCE BETWEEN THESE MODES. THE TWO STATES OF THE DUAL STATE OPTIC ARE GENERATED BY APPLYING CONTROLLED PATTERNS OF SMALL AMPLITUDE, HIGH FREQUENCY OSCILLATIONS TO ONE OF THE COMPONENTS IN THE OPTICAL SYSTEM, SUCH AS THE SECONDARY MIRROR. THE OSCILLATIONS WHICH ARE SOFTWARE PROGRAMMABLE CAN BE VARIED IN REAL TIME TO OPTIMIZE PERFORMANCE IN AN UNKNOWN NUCLEAR ENVIRONMENT.

W. J. SCHAFFER ASSOCIATES, INC. CORPORATE PLACE 128, BLDG. 2, STE 300 WAKEFIELD, MA 01880 DR. JAMES P. REILLY TITLE: PULSED SHORT WAVELENGTH LASER EFFECTS SIMULATOR TOPIC: 5	DNA	\$ 47,415
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OFFICE: DDST

INVESTIGATE POTENTIAL OF A NOVEL CONCEPT TO GENERATE SPECIFIC WAVELENGTH REGIONS OF HIGH INTENSITY RADIATION AND/OR PLANAR BLAST WAVES TO PRODUCE, ON CLOSE-BY (TARGET) STRUCTURES AND/OR MATERIALS, THE THERMAL AND/OR SHOCK LOADINGS DELIVERED BY SINGLE PULSE OR REPETITIVE PULSE LASERS. THE CONCEPT, IF SUCCESSFUL, COULD APPLY OVER LARGE (ONE FOOT OR MORE) DIAMETER AREAS ON LARGE, SCALABLE STRUCTURES/MATERIAL SAMPLES THE EXACT INTENSITIES, PULSE DURATIONS PRESSURES AND IMPULSES LOADINGS EXPECTED OF THOSE CLASSES OF LASERS CONSIDERED FOR DEW APPLICATIONS, BUT WITH MUCH LESS ENERGY INPUT. ATTRACTIVE COMMERCIAL APPLICATIONS OF SUCH WAVELENGTH-TUNABLE REPPED PULSE RADIATION AND PRESSURE, COATING CURING AND PRESSURE FORMING.

W. W. GAERTNER RESEARCH, INC. 205 SADDLE HILL ROAD STAMFORD, CT 06903 DR W. W. GAERTNER TITLE: ARTIFICIAL INTELLIGENCE (ROBOT JAMMER) TOPIC: 1e	ARMY	\$ 59,763
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OFFICE: ERADCOM

TECHNIQUES OF ARTIFICIAL INTELLIGENCE WILL BE USED TO DESIGN A ROBOT JAMMER WHICH CAN DEVISE AN OPTIMUM JAMMING STRATEGY. A MODEL OF THE UNIVERSE IN WHICH THE JAMMER WILL OPERATE WILL BE DEVELOPED. THIS MODEL WILL INCLUDE THE VARIOUS FORMS OF ACTIVITY THAT CAN OCCUR WITH-

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
<p>IN THE ADVERSARY SYSTEM, ACTIONS THAT THE JAMMER CAN TAKE, AND MODES OF OPERATION DEFINING THE PURPOSE OF THE JAMMING. THE JAMMER'S KNOWLEDGE OF ADVERSARY ACTIVITY IS DERIVED BY INTELLIGENTLY INTERPRETING THE ELECTRICAL SIGNAL ENVIRONMENT MEASURED BY ITS SENSORS. THE INTERACTIONS BETWEEN THE ADVERSARY SYSTEM AND THE JAMMER WILL BE MODELED, USING A GAME THEORETICAL APPROACH. ONCE A SUITABLE GAME HAS BEEN SELECTED, A COMPUTER PROGRAM WILL ATTEMPT TO DEVISE AN OPTIMUM STRATEGY FOR PLAYING THE GAME. THIS PROGRAM WILL TAKE ADVANTAGE OF THE TECHNOLOGY DEVELOPED IN ARTIFICIAL INTELLIGENCE FOR PLAYING GAMES OF INCOMPLETE INFORMATION. ACTIONS WILL BE DIRECTED BY A PRODUCTION SYSTEM WHICH MAKES DECISIONS BASED UPON THE VALUES OF KEY VARIABLES WHICH MAKE UP A DYNAMIC STATE VECTOR. THIS PRODUCTION SYSTEM WILL BE SELF-MODIFIABLE SO THAT THE SYSTEM CAN LEARN FROM ITS PAST EXPERIENCE TO IMPROVE ITS PERFORMANCE.</p>		

WYATT TECHNOLOGY COMPANY
350 S. HOPE AVENUE,
SANTA BARBARA, CA 93130
PHILIP J. WYATT
TITLE:
SUBMICRON PARTICLE ANALYSER
TOPIC: 4a OFFICE: CRDC

ARMY \$ 49,924

A PROGRAM IS PROPOSED TO ESTABLISH THE DESIGN AND OPERATIONAL CHARACTERISTICS OF A REALTIME SUBMICRON PARTICLE ANALYSER. THE ANALYSER IS BASED ON THE EARLIER CONFIRMED CONCEPT OF SIMULTANEOUSLY MEASURING CERTAIN SPECIFIED OPTICAL OBSERVABLES OF INDIVIDUAL AEROSOL PARTICLES AS THEY STREAM ONE-AT-A-TIME THROUGH A LOW POWER POLARIZED LASER BEAM. USING COMPACT, COMPUTER-STORED SUMMARIES OF THESE OBSERVABLES, PARTICLES ARE IDENTIFIED AS TO SIZE, SHAPE, AND REFRACTIVE INDEX AT RATES UP TO 20000/MIN. KEY DESIGN PARAMETERS INCLUDE LOW POWER REQUIREMENTS, RUGGED CONSTRUCTION AND LOW WEIGHT. BOTH EXPERIMENTAL AND THEORETICAL OPTICAL OBSERVABLES FOR VARIOUS TYPES OF SUBMICRON PARTICLES STRUCTURES WILL BE USED TO TEST THE INSTRUMENT DESIGN AND SOME SAMPLE HANDLING MEASUREMENTS PERFORMED FABRICATION OF A BREADBOARD SYSTEM FOR PHASE II FUNDING IS PROPOSED.

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ---	AWARDED AMOUNT -----
XEBEC CORPORATION 3206 MONROE STREET ROCKVILLE, MD 20852 ROBERT H BADGLEY TITLE: MULTI-PARAMETER METHODOLOGY AND PROGRAM DESIGN FOR MAINTENANCE TOPIC: 9u OFFICE: CORPS OF ENG	ARMY	\$ 49,994

COMPLICATED AND EXPENSIVE ELECTRIC GENERATING AND ENERGY-USING EQUIPMENT MUST OPERATE OVER LONG PERIODS OF TIME WITH MINIMUM OPERATOR ATTENTION. THE NEED FOR HIGHER EFFICIENCY FOR OPERATIONS IN HOSTILE ENVIRONMENTS MAY BE COMPLICATING FACTORS. THE RESULT IS THAT "SINGLE POINT" MEASUREMENTS WHICH REQUIRE OPERATOR INTERPRETATION AND SYNTHESIS ARE OFTEN INADEQUATE SOURCES OF FAILURE TREND MAINTENANCE DATA. THE SENSOR, DATA GATHERING, AND COMPUTER TECHNOLOGIES ALL HAVE MADE MAJOR ADVANCES DURING THE PAST DECADE. THERE HAVE ALSO BEEN ADVANCES IN THE ART OF PROVIDING "INTELLIGENCE" FROM THE PROPER COLLECTIVE INTERPRETATION OF DATA FROM DIFFERENT SOURCES. THE NEXT APPROPRIATE STEP IS TO COMBINE THESE ADVANCES INTO A NEW SYSTEM OF EQUIPMENT CONDITION "INTELLIGENCE GATHERING." EFFECTIVE USE OF STATISTICAL ANALYSES, TOGETHER WITH AVAILABLE SENSOR DATA, CAN PROVIDE EXTREMELY HIGH CONFIDENCE LEVELS CONCERNING THE CONDITION OF CRITICAL OPERATING EQUIPMENT. THIS WILL ALLOW THE EQUIPMENT TO RUN FOR LONGER PERIODS OF TIME, BE MAINTAINED MORE EFFECTIVELY, AND SUBSTANTIALLY IMPROVE OPERATIONAL READINESS. AVAILABILITY OF THIS TYPE OF DATA WILL ALSO PROVIDE THE OPPORTUNITY TO BETTER DEFINE MISSION PROFILES, AND TO ASSIST IN VALIDATING EQUIPMENT SIZING SELECTIONS.

XMR INC. 3350 SCOTT BLVD., #57 SANTA CLARA, CA 95051 DR. SHELDON B. HUTCHISON TITLE: DIATOMIC SULFUR BLUE-GREEN LASER EXCITATION EXPERIMENTS TOPIC: 88 OFFICE: NESC	NAVY	\$ 47,892
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IN ORDER TO PROVIDE SECURE UNDERWATER OCEANIC COMMUNICATIONS, VARIOUS BLUE-GREEN LASER SYSTEMS ARE CURRENTLY UNDER CONSIDERATION. DIATOMIC SULFUR (S2 B--->X) RADIATION WHICH IS LINE TUNABLE THROUGHOUT THE BLUE-GREEN PRESENTS AN ATTRACTIVE ALTERNATIVE. THE PROPOSED EFFORT

FISCAL YEAR 1983

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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WILL EXPLORE DISCHARGE FORMATION OF DIATOMIC SULFUR VAPOR WITH
EXTERNAL OPTICAL EXCITATION PROVIDED BY XENON CHLORIDE ULTRAVIOLET
(λ = 308 nm) SOURCES.

YLYK LTD.

AF

\$ 49,787

P.O. BOX 7966

ANN ARBOR, MI 48107

BOB BLAKLEY

TITLE:

HIGH-SPEED LOW-COST WAYS TO GET MESSAGES FROM A SENDER TO A RECEIVER
WHEN SOME CHANNELS LINKING THEM BECOME INOPERATIVE

TOPIC: 14a

OFFICE: AFOSR/XOT

MILITARY COMMUNICATIONS SYSTEMS ARE SUBJECT TO TRAUMA. CERTAIN CHANNELS FAIL FOR PROTRACTED PERIODS OF TIME. THE RED NOISE PROBLEM ARISES WHEN SOME, BUT NOT ALL, OF THE CHANNELS LINKING A SENDER TO A RECEIVER BECOME INOPERATIVE. THE SOLUTIONS TO THIS PROBLEM ARE CALLED POOL/SPLIT/RESTITUTE PROCESSES. P/S/R PROCESSES AMOUNT TO WAYS TO ENCODE DIGITAL MESSAGES AT A SENDING NODE SO AS TO MAKE SURE THAT ALL TRANSMITTED INFORMATION GETS THROUGH AND IS DECODED CORRECTLY AT THE RECEIVING NODE WHENEVER AT LEAST K OUT OF THE N CHANNELS LINKING THOSE TWO NODES REMAIN OPERATIVE. P/S/R PROCESSES ARE DESIGNED TO WORK EVEN THOUGH THE SENDING NODE HAS NO WAY TO TELL WHICH OF THE CHANNELS IT IS USING ARE INOPERATIVE. IT HAS BEEN KNOWN FOR A LEAST TWO YEARS THAT THE ENCODE AND THE DECODE OPERATIONS IN A P/S/R PROCESS ARE FASTER AND SIMPLER THAN THOSE IN ANY BUT THE WEAKEST AND MOST TRIVIAL ERROR CORRECTING CODES. MOREOVER THE BAND WIDTH EXPANSION IS TYPICALLY SMALLER IN A P/S/R PROCESS THAN IN AN ERROR CORRECTING CODE ADAPTED TO DO THE SAME JOB. THIS PROJECT IS AIMED AT PRODUCING A FURTHER ORDERS-OF-MAGNITUDE IMPROVEMENT IN THE THEORY OF P/S/R PROCESSES. THIS CARRIES OVER INTO A COMPARABLE IMPROVEMENT IN IMPLEMENTING THEM.

TOTAL NUMBER OF AWARDS: 283 TOTAL AMOUNT AWARDED: \$15,353,332

END

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